4-22-43

ELECTRICAL WEST

THE ALL-INDUSTRY MAGAZINE OF PROGRESS

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APR 15 1943
Durham, N. C.

McGraw-Hill Co. of California

Manufacturers' Directory—April, 1943

25c a Copy

Have PLENTY of Light Inside
Dim-out outside, yes . . . but not inside your home! Now more than ever, you need the cheery glow of lots of friendly light. It lifts your spirits . . . keeps morale high. And it's essential for quick, easy seeing when you and your family read, sew, study or play games. Light bulbs are still plentiful and inexpensive. So is electricity. Brighten up every evening with plenty of light inside your home!
Edison
SOUTHERN CALIFORNIA EDISON COMPANY LTD.
It's good to be in and have plenty
Pull down the shades and turn on the lights
In millions of homes throughout the world, there is no light when night comes. People exist in darkness, fear and discomfort. But you and your family still can enjoy all the benefits of good light in your home—the ease of seeing, the greater comfort and relaxation, the lift to morale. Here light is a symbol of freedom. And here there is an abundance of electricity ...and light bulbs are plentiful and inexpensive.
SOUTHERN CALIFORNIA Edison EDISON COMPANY LTD.

"HAVE PLENTY OF LIGHT"

Although the Edison Company's first war-time responsibility is to meet the power requirements of Southern California's war industries, Edison is fulfilling its obligations to its customers on the "home front" too. The advertisements shown here, part of a series which recently appeared in newspapers throughout Edison territory, advise customers to avoid "dim-out" inside their homes. They emphasize the benefits of good light and point out that there is no rationing of Edison electricity.

SOUTHERN CALIFORNIA Edison EDISON COMPANY LTD.

ELECTRICAL WEST (with which is consolidated The Journal of Electricity), April, 1943. Vol. 90, No. 4. Published monthly by the McGraw-Hill Company of California, 68 Post Street, San Francisco, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rate in U. S. and U. S. possessions, and Canada, $2 per year; all other countries $3 gold (thirteen shillings). Single copy 25c.
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Oil-drenched and salt-encrusted, PYRANOL TRANSFORMERS COME THROUGH UNHARMED

Three Pyranol transformers were in operation on a large tanker when it was torpedoed off the Atlantic coast. For days they lay submerged in oil and salt water, until what was left of the tanker was salvaged. When the ship finally reached dry dock, the transformers were tested and found to be in as good working condition as the day they were installed.*

IT'S HARD to find an application where Pyranol transformers won't fill the bill. The high dielectric strength which they have in common with other liquid-filled transformers makes it easy for them to withstand the effects of lightning and of voltage surges from switching operations.

Install Pyranol Transformers Right Where You Need Them

Location doesn't matter; you can install Pyranol transformers underground, on an overhead platform, on the roof, on the factory floor, indoors or outdoors—or install them indoors this year and move them outdoors next year if your needs change. The pressure-tight tank protects vital parts from the effects of dust, dirt, and atmospheric moisture—as well as from oil and salt water.

Maintenance Cost Is Low

Pyranol, the synthetic, noninflammable liquid with which these transformers are filled, is nonsludging—maintenance is negligible. Tests made recently show that the Pyranol in the first transformers of this type, installed more than ten years ago, is still in its original condition.

For further information about Pyranol transformers, call your G-E representative today. He'll be glad to help you. *General Electric Company, Schenectady, New York.*

*Reg. U.S. Pat. Off.

GENERAL ELECTRIC

Here in the WEST

People

Henry V. Lutge

pictured at left is co-author with E. F. Maryatt of the Narrows article (p. 60). He has been assistant engineer for PG and E for more than 22 years. Born in San Jose, he has a civil engineering degree from U. of C. His hobby is his garden—at present the Victory variety.

E. F. Maryatt

was born in Weiser, Idaho, and received his electrical engineering degree from Illinois University. His first job was with the Telephone company in Seattle. In 1909 he went with Stone & Webster, serving in various posts. He joined PG and E in 1921; is assistant engineer.

Gilbert L. Yetter

author of *Welding Innovations for High Dams* (p. 65) is a native Pennsylvanian; attended the state college and LeHigh University. His first job was with Pennsylvania Steel. With the Navy Department and later with USBR, he has had a wide experience in the metallurgy of welding and radiographic examination of metals. He served the Navy Department in various districts as hull inspector, senior inspector and in construction. He has been with USBR since 1933 and has been associated with several Western projects, and with the Denver and San Francisco offices.

Pages

PCEA Launches Postwar Program 57
Postwar planning committee states objectives; enlists utilities in "Planning for Peace" projects.

Multiple Purpose River Development 60
By H. V. LUTGE and E. F. MARYATT—Maximum benefits for power and mining derived from Narrows project.

Every Machine Tool in the City Indexed 69
Los Angeles bureau initiates program of mutual aid for prime and subcontractors.

Repair Service Is 75% Detail 78
Procedure to trace appliance from its entry to delivery expedites service, reduces cost.

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Cover photo: Loaded with Miller industrial F units, leaving G-E Supply, San Francisco, the truck was destined for Brodie Meter Co., Oakland, for installation by California Electric Co. George Smith, Charlie Fink and Charles Geppert were filling a Navy order.

Preview

Power Pool

Last June the Power Branch of the WPB suggested the formation of a Power Interchange Committee in southern California for the purpose of integrating power supply and war loads. An initial report on the operation of the arrangement has been prepared by the chairman, Fred B. Lewis, for the information of the industry. It's a story of industry wartime service.

Dogs of War

Bane of the meter reader's life, the dog has taken on a wartime role in the utility business. He's a guard, supplementing men at power plants and substations. Puget Sound Power & Light has 19 dogs on the "pay roll." An article to be published next month tells about breeds, selection and training as well as recounting some human interest incidents. If you don't know it, dogs don't bother women meter readers nearly so much as they did the male predecessors.

These Women

are into everything nowadays, not only welding, but doing electrical installation, reading meters, operating substations, doing drafting and operating trucks. Next month a number of cases of women in war work in the industry will be illustrated and something of their selection, training, and the experience with them as workers discussed.

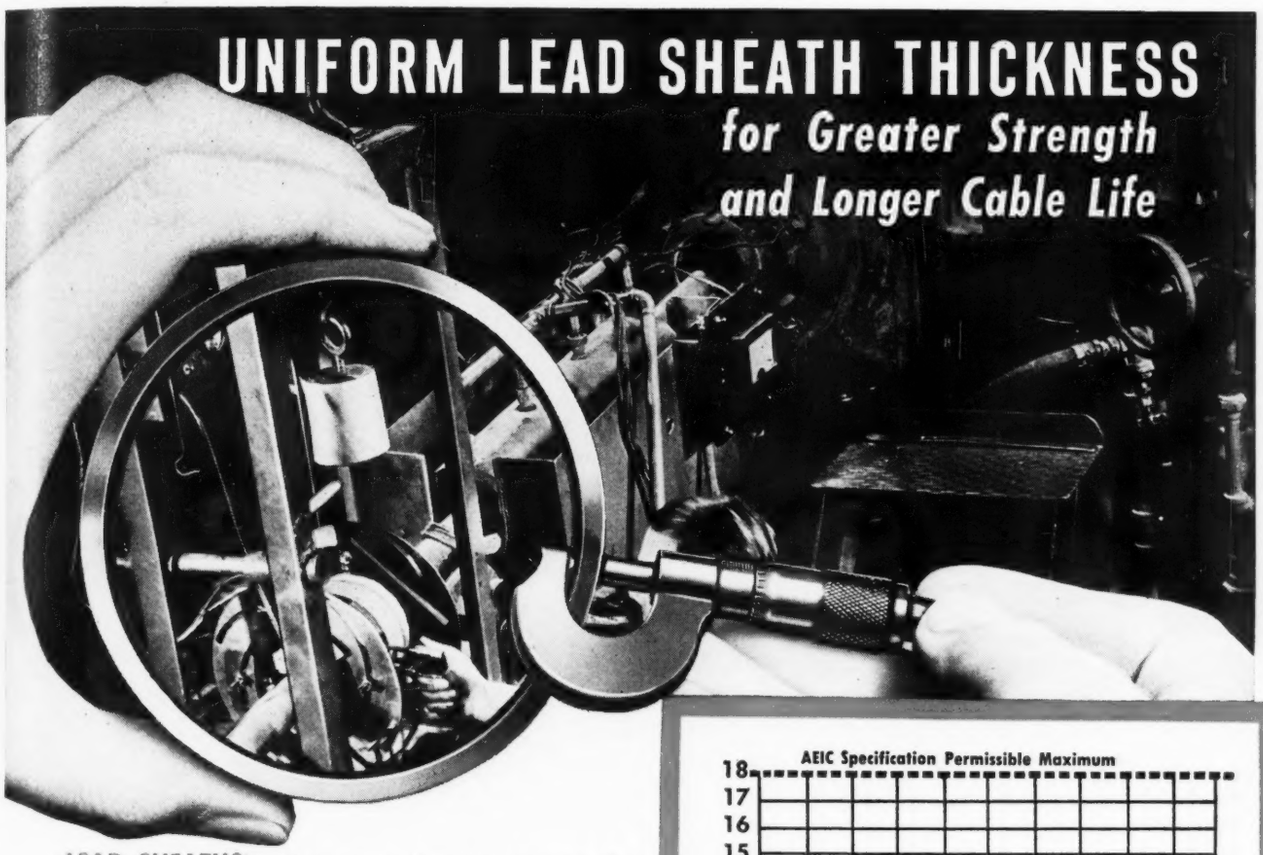
Convention in Print

June issue will really once again become the industry's convention, as it did in the depth of the depression. Then it was cost, now it is transportation that prevents the much needed interchange of thought and methods. But the June issue will endeavor to make up for that lack.

Thought-provoking papers on public relations, idea sharing engineering methods, a report to the industry of home front activities—all these and more will be included in the "program".

Through OKONITE-CALLENDER RESEARCH...

UNIFORM LEAD SHEATH THICKNESS
for Greater Strength and Longer Cable Life

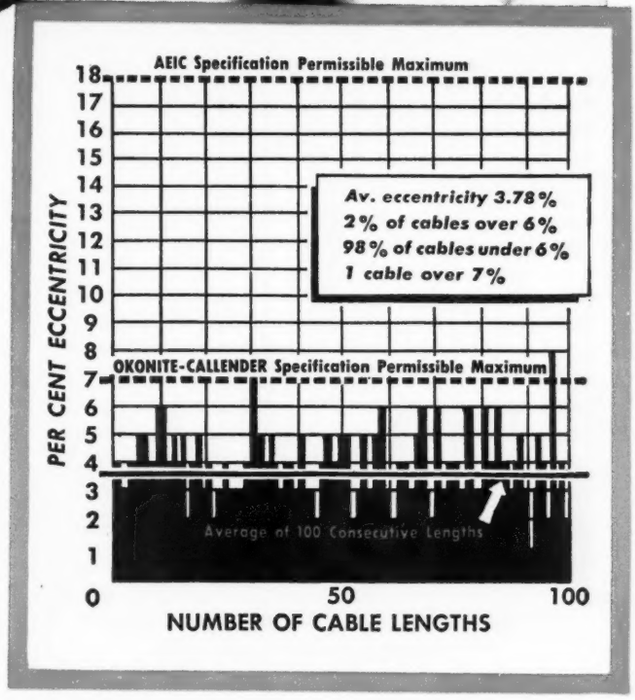


LEAD SHEATHS, which are otherwise free from structural defects, will fail ultimately at the thinnest point and cause cable failures.

The Okonite-Callender electric concentricity gauge measures the slightest deviation in sheath thickness throughout the length—at top, bottom and either side—thus permitting immediate adjustment of the lead press to keep the sheath uniform.

The accompanying chart shows the results of actual micrometer measurements made on 100 consecutive lengths of Okonite-Callender Paper-Insulated Lead-Covered Cables. This lead sheath uniformity was made possible by use of the Okonite-Callender electric concentricity gauge for lead press control.

When you are considering paper-insulated cable, it will pay you to have our engineers explain the many other Okonite-Callender research developments that contribute to longer cable life.

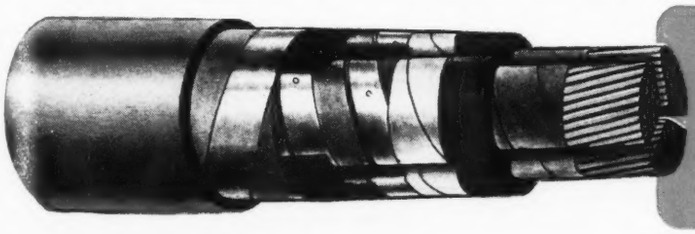


● Individual lead sheath eccentricity record. Results of actual micrometer measurements made on 100 consecutive lengths of Okonite-Callender Paper-Insulated Lead-Covered Cable, manufactured in regular factory production during January, 1943, and tested for sheath eccentricity in accordance with procedure required by A.E.I.C. specifications.

THE OKONITE-CALLENDER CABLE CO., Inc.

AN AFFILIATE OF THE OKONITE COMPANY

Executive Offices, Passaic, N. J. *Offices in principal cities*



OKONITE-CALLENDER
PAPER INSULATED POWER CABLES

3259

Salvage Your Scrap — Buy U. S. War Bonds

Another "Power" the Axis forgot...

OUR POWER MAKERS

whose electrical output is the Lifeblood of War Production

IF you haven't already done so, Herr Hitler, you had better scrap your intuition. For in your carefully laid plans for world conquest, it has failed you once more. It has failed to warn you of a "Power" more formidable than any you have yet faced. That "Power", Herr Hitler, is *electric power*, American electric power, the power behind American production—the power that has met and will continue to meet every demand from our American factories geared to relentless war for Victory.

Electric Power has now become the yardstick of a nation's capacity for war. Here in America ours is almost limitless; thanks to the foresight of our power makers, the supply of electrical energy has always paced demand. It is not an accident that every war plant in America that needed more electric power got it when and where it was needed.

Forward planning has always been a characteristic of the utility industry. It has never waited until a demand for power developed. Theirs has been the job of anticipating demand and being "Johnny-on-the-spot" with adequate facilities so that when a switch was thrown, there was power available in the quantity needed. That is why America's war producing machinery went into high gear so soon. That is why the "Power" Hitler forgot is now making itself felt on all fronts, and will continue to increase into a mighty crescendo of thundering tanks, planes, guns and ships to overwhelm and completely destroy the evil forces that would enslave us.

GENERAL CABLE
CORPORATION

MANUFACTURERS OF BARE AND INSULATED WIRES AND CABLES FOR EVERY ELECTRICAL PURPOSE

G E N E R A L C A B L E

This General Cable message recently appeared in the country's leading influential newspapers. This and previous messages have been planned and timed to impress on the thinking people of America the vital role the Utility Industry is playing in the war effort, to the end that they do not overlook or forget in the years ahead the job you are doing and what "you've got to have" to do it.

☆ **General Cable Corporation Sales Offices:** Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Kansas City (Mo.), Los Angeles, New York, Philadelphia, Pittsburgh, Rome (N.Y.), St. Louis, San Francisco, Seattle, Washington (D.C.)

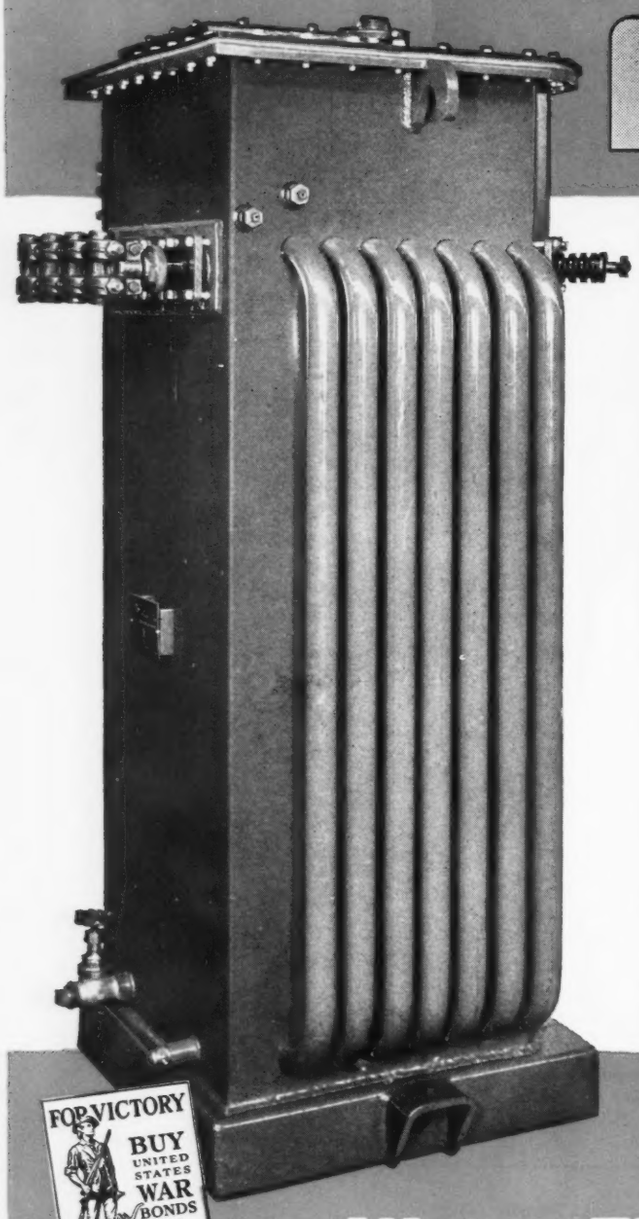
C O R P O R A T I O N

WAGNER

NOFLAMOL TRANSFORMERS

(NON-INFLAMMABLE LIQUID-FILLED)

Give you a combination of advantages worth investigating



★ **INDOOR INSTALLATION WITHOUT VAULT**

Noflamol transformers may be installed indoors without the use of expensive fireproof vaults since the liquid used in the transformers is non-inflammable. Considerable installation expense is thereby avoided.

★ **IMPROVED PLANT EFFICIENCY . . .**

Savings are effected by dividing the circuit into several sections and placing a Wagner Noflamol transformer at the load-center of each, eliminating long runs of secondary copper, reducing line losses, and improving voltage regulations. Plant efficiency is thereby improved.

★ **NO SPECIAL FOUNDATIONS . . .**

The only foundation necessary for installation of Wagner Noflamol transformers is a level floor, strong enough to support their weight.

★ **SAVES VALUABLE FLOOR SPACE . . .**

Wagner Noflamol transformers may be installed in out-of-the-way places, thereby releasing valuable floor space for production. Since no vault is needed, less space is necessary for a Noflamol transformer installation.

★ **SAVES MAINTENANCE EXPENSE . . .**

The liquid used in Noflamol transformers is chemically stable, has high dielectric strength, and will not sludge.

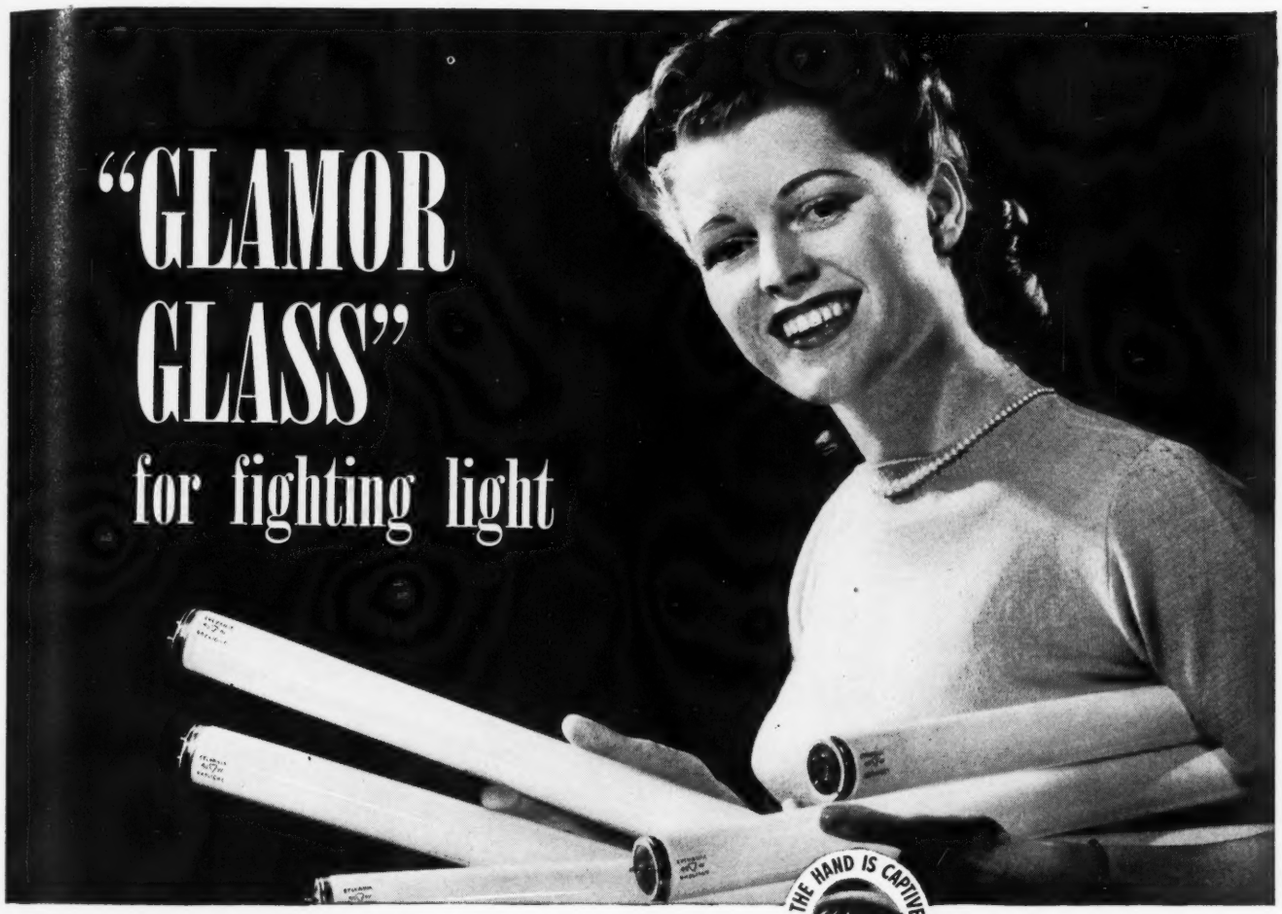
Bulletin TU-33 describing Wagner Noflamol transformers will be mailed on request.

T43-1

Wagner Electric Corporation

6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.

TRANSFORMERS • MOTORS • BRIDGE BRAKES



● There is glamor in the glass that houses the electronic miracle of fluorescent lamps. These long light sources provide the cool, shadowless, glarefree illumination that works a "charm" in speeding war production in plants all over America.

There is glamor, too, in the careful "beauty salon" treatment of glass at Sylvania. Before acceptance it undergoes 16 different inspections for possible imperfections. It is handled with gloves — to avoid possible contamination from contact with human hands. It is even washed, dried, brushed, and vacuum-cleaned in air-conditioned rooms.

Sylvania "glamor glass," like the development of the "Mercury Bomb" method of precise mercury measurement, is a formula that conserves vital metals for war. But all the material and process changes, made continually at Sylvania, must and do step up fluorescent performance and effect important economies.*

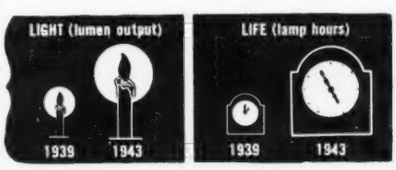
It is because of Sylvania's many years of independent and aggressive research that fluorescent, today the best industrial lighting, is destined to light our homes, offices and stores when Victory is won.

To obtain research dividends of more light output, longer life and uniform color, specify Sylvania Fluorescent Lamps — each one better than the last — for replacements.

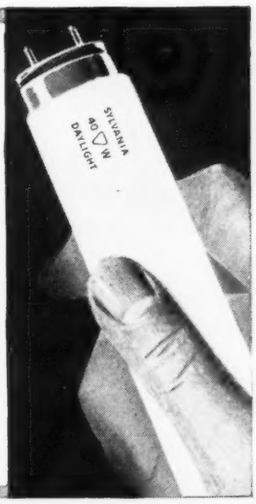
SELL SYLVANIA AND GIVE YOUR CUSTOMERS FAR MORE LIGHT AND LIFE FOR THEIR MONEY

*Compared with 1939 a dollar invested today in Sylvania Fluorescent Lamps buys more than four times the lumen output and approximately five times the lamp life.

SYLVANIA FLUORESCENT DOLLAR BUYS:



(Based on decreasing price and increasing efficiency and durability of Sylvania 40-Watt White Fluorescent Lamp)



SYLVANIA

ELECTRIC PRODUCTS INC.

Formerly Hygrade Sylvania Corporation
Salem, Mass.

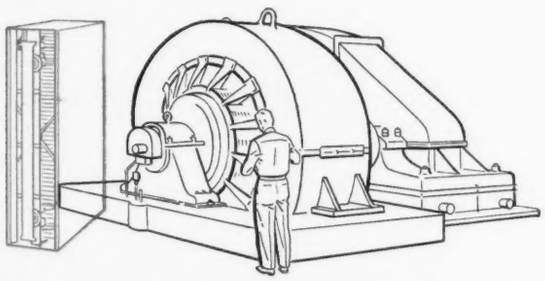
Incandescent Lamps, Fluorescent Lamps, Fixtures and Accessories, Radio Tubes, Electronic Devices.

Electronics

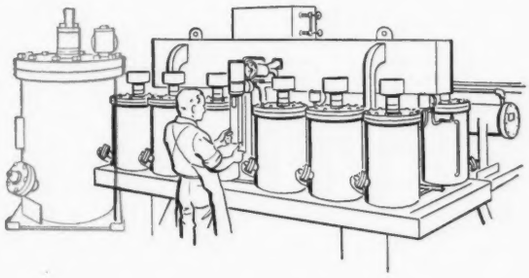
Detecting Sources Of Vibration in airplane crankshafts is the job of this Dynetric Balancing Machine. Through electronic amplification, unbalance vibrations as small as *twenty-five millionths* of an inch are located and measured in a few seconds. Detecting and correcting these harmful impulses before they can do damage is a vital step toward eliminating excessive crankshaft and piston wear, thus preventing loss of engine efficiency.

. . at Work

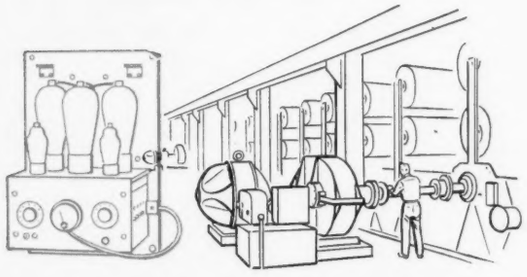
Electronic devices are at work today in practically every war industry. They are helping to roll back old limits on production capacity—saving time, cutting costs, improving products. Here are typical examples from a long list of practical applications—showing how and where you'll find Westinghouse "Electronics at Work."



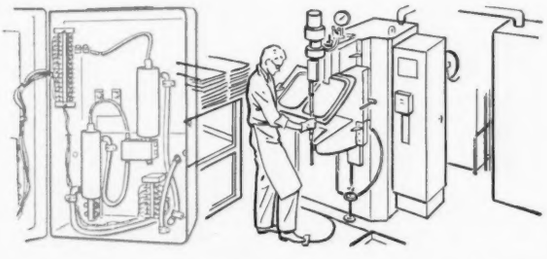
Cleaning the Air in steel mill motor-rooms is one of many applications of the PRECIPITRON, Westinghouse electric air cleaner. By trapping air-borne dust, dirt and soot—including particles as small as 1/250,000 of an inch—it prevents damaging dirt from settling in machine windings. Result: Increased operating efficiency, fewer shutdowns for maintenance.



In Aluminum Production, large quantities of d-c power are required. The Ignitron Rectifier, electronic device developed by Westinghouse, converts alternating current to direct current at *higher efficiency* than any other type of equipment. It carries rated loads continuously—24 hours a day. Because there are no major moving parts, maintenance is practically eliminated.



Highly Accurate Control of motor performance is essential for uniformity of product in the paper and other process industries. By Electronic means, more precise control of speed, voltage, acceleration, and other characteristics can be obtained. The absence of any moving parts permits maintaining the highest possible degree of sensitivity, without the necessity of frequent maintenance.



Mass-Production Welding has been made possible largely through the development of modern resistance welding techniques. By this method, metal parts are now fabricated far faster than ever before. To deliver high-quality welds of uniform strength, accurately controlled current must stab through the metal as often as 1800 times a minute. In scores of plants, Westinghouse Electronic Timers provide this precision control.

J-91007

For further information on practical applications of Westinghouse Electronic devices, write or phone your nearest Westinghouse office. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Westinghouse ELECTRONICS

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

We wanted the sturdiest, most durable non-metallic reflector we could get for the MILLER 50 FOOT CANDLER and 100 FOOT CANDLER.

After testing many materials, we selected Masonite Reflector Board. It was developed especially for use as a reflector and provides the qualities of strength and permanency that Miller Products always have. Next, we treated it with IVANITE, an exclusive finish developed right here in our own plant. The result? A rugged, light-weight, easy-to-handle reflector with a durable high reflection factor . . . plus conspicuous savings of precious steel for Uncle Sam.

That's typical of the mechanical ingenuity behind the MILLER Continuous Wireway Fluorescent Lighting System. It's the kind of engineering that provides such proven user-benefits as *low installation cost, daylight efficiency, easy maintenance, complete mobility.* (Check column at right.) And it makes MILLER 50 FOOT CANDLER or 100 FOOT CANDLER your ideal lighting system for today's war needs, tomorrow's shift to new products or changed plant layout.

Your nearby MILLER field engineer can discuss these good things in terms of your specific business. Call him in today, or write us direct.

CHECK THESE MILLER FLUORESCENT FEATURES

INSTALLATION SAVINGS—MILLER'S CONTINUOUS WIREWAY contains all wiring and necessary auxiliaries—MILLER'S flanged top channel permits clamp strap attachment at any point for quick mounting or hanging to any type superstructure.

DAYLIGHT EFFICIENCY—Adequate, productive, modern lighting for your specific plant needs, evenly distributed to every working surface.

EASY MAINTENANCE—new durable, light-weight reflectors of MASONITE Reflector Board with exclusive IVANITE finish are easy to handle and keep clean—demount simply and quickly, can even be handled by women workers.

COMPLETE MOBILITY—entire rows of units are easily moved—units in rows can be cut out readily.

THE MILLER COMPANY · MERIDEN, CONNECTICUT

ILLUMINATING DIVISION
Fluorescent, Incandescent
Mercury Lighting Equipment

OIL GOODS DIVISION
Domestic Oil Burners
and Liquid Fuel Devices

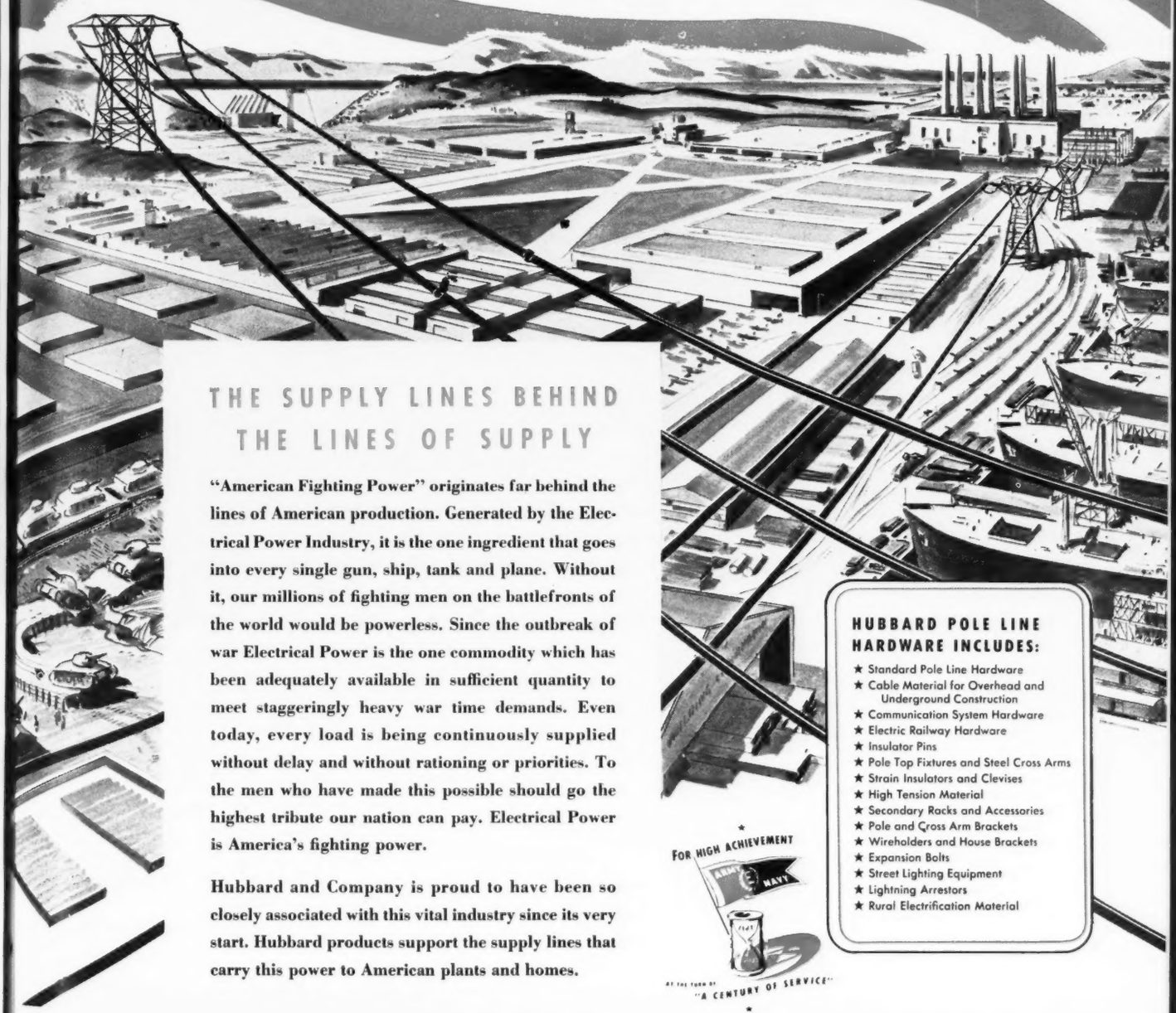
ROLLING MILL DIVISION
Phosphor Bronze and Brass
in Sheets, Strips and Rolls

WAR CONTRACTS DIVISION
War Materiel

MILLER
SINCE 1844

The Untold Story of America's Fighting Power

—SUPPLIED BY THE ELECTRICAL POWER INDUSTRY



THE SUPPLY LINES BEHIND THE LINES OF SUPPLY

"American Fighting Power" originates far behind the lines of American production. Generated by the Electrical Power Industry, it is the one ingredient that goes into every single gun, ship, tank and plane. Without it, our millions of fighting men on the battlefronts of the world would be powerless. Since the outbreak of war Electrical Power is the one commodity which has been adequately available in sufficient quantity to meet staggeringly heavy war time demands. Even today, every load is being continuously supplied without delay and without rationing or priorities. To the men who have made this possible should go the highest tribute our nation can pay. Electrical Power is America's fighting power.

Hubbard and Company is proud to have been so closely associated with this vital industry since its very start. Hubbard products support the supply lines that carry this power to American plants and homes.

HUBBARD POLE LINE HARDWARE INCLUDES:

- ★ Standard Pole Line Hardware
- ★ Cable Material for Overhead and Underground Construction
- ★ Communication System Hardware
- ★ Electric Railway Hardware
- ★ Insulator Pins
- ★ Pole Top Fixtures and Steel Cross Arms
- ★ Strain Insulators and Clevises
- ★ High Tension Material
- ★ Secondary Racks and Accessories
- ★ Pole and Cross Arm Brackets
- ★ Wireholders and House Brackets
- ★ Expansion Bolts
- ★ Street Lighting Equipment
- ★ Lightning Arrestors
- ★ Rural Electrification Material

★ FOR HIGH ACHIEVEMENT

AT THE TOKEN OF "A CENTURY OF SERVICE" ★

HUBBARD

Hubbard and COMPANY

OAKLAND, CAL. PITTSBURGH CHICAGO

HUBBARD

HANG THE LOAD ON HUBBARD HARDWARE

New Nation-wide Campaign

... OFFERS VALUABLE WARTIME HELP

How soup stock in your
FRIGIDAIRE
helps you build
many grand meals
Try this simple Soup Stock recipe*
It's easy to keep
It's easy to use in dishes like these
Delicious Tomato Soup
It's easy to prepare
Treat your refrigerator right
—use it properly
Rich Bean Soup
15 Minute Vegetable Soup
Glorified Baked Hash
Buy War Bonds for Victory
See free offer on opposite page
Next month look for:
"How to Keep Meat"
FRIGIDAIRE Division of GENERAL MOTORS
This new free booklet from
FRIGIDAIRE
helps you solve many
wartime food problems
36 pages of simple, practical suggestions—specially prepared
to give wartime help to those who bought more than 7 million Frigidaires—
now offered to every refrigerator user! Call or
send for your free copy of WARTIME SUGGESTIONS today.
You face
new
problems
Do you know these things?
Get WARTIME SUGGESTIONS booklet from your Frigidaire Dealer or mail coupon below
Frigidaire tells you how
More help to come
FRIGIDAIRE DIVISION,
General Motors Corporation,
347 Taylor St., Dayton, Ohio
Please send me my free copy of your "WARTIME SUGGESTIONS."
Name
Address
City
State
PRODUCTS OF GENERAL MOTORS
"FOR SERVICE CALL"

New! NATIONAL ADVERTISING

Frigidaire's new advertising will give women timely, helpful and authentic information the way they are used to finding it in their favorite women's magazines.

The above advertisement is typical. Now that canned foods are rationed, more women will prepare soup at home. Frigidaire provides a real service by telling homemakers how to make a simple soup stock, how to keep it, and ways to use it in wholesome, nourishing dishes. It is the kind of advertising that will be widely read and sincerely appreciated by women everywhere.

Each advertisement in the series deals with a timely food or refrigeration subject of special interest to women. Each refers readers to the Frigidaire Dealer for Frigidaire's Free WARTIME SUGGESTIONS booklets. Each tells how to locate the Frigidaire dealer, thus tying him in directly with this National Campaign.

Watch for this Frigidaire Advertising in Ladies' Home Journal, Woman's Home Companion, Good Housekeeping, McCall's, Better Homes and Gardens, American Home, Farm Journal and Farmer's Wife, and True Story!

by FRIGIDAIRE

EVERY HOMEMAKER NEEDS TODAY!

Has These 4 Important Objectives:

1. To cooperate with the Government's programs for conserving the nation's food and food-keeping equipment.
2. To render a real and needed service not only to Frigidaire users, but also to the users of all other refrigerators.
3. To help keep the name Frigidaire before the public in a way that will be favorably remembered.
4. To help Frigidaire Dealers maintain their identification with Frigidaire and to build good will for themselves.

Like many other manufacturers, our major responsibility is to build war materials for our armed forces. Yet recognizing the importance of refrigeration to the food and health of America, we are embarking upon a new nation-wide campaign to help homemakers solve their new wartime problems. The benefits of our unequalled refrigeration experience will be passed on to the users of the more than 7 million Frigidaires that have been sold—and to all other refrigerator users.

We firmly believe that this campaign will contribute to the war effort on the home front and bring real and substantial benefits to every member of the Frigidaire organization.

New! WARTIME SUGGESTIONS Booklet

To help Frigidaire Dealers benefit fully from this new Campaign, they will receive, without charge, Frigidaire's popular WARTIME SUGGESTIONS booklets for free distribution in their communities.

This booklet, originally introduced nearly a year ago, has now been revised and enlarged to 36 pages. It's literally packed with practical and useful ideas like those shown on the opposite page. It tells how to keep meat, what to keep in a refrigerator, what to leave out, how to defrost in 15 minutes. It gives tested wartime recipes and dozens of other helpful tips on how to make a refrigerator serve better and last longer.

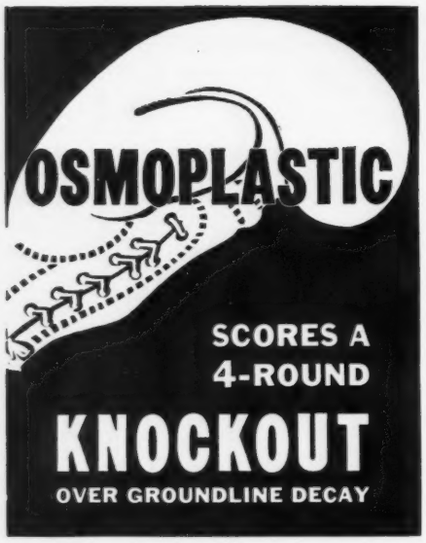
Backed by 25 years' experience in the food-keeping field, the WARTIME SUGGESTIONS booklet represents the combined thinking of Frigidaire Home Economists, Engineers and Service Specialists. It was prepared with the assistance of leading women's magazine editors and reviewed by other eminent food authorities.

New! DISPLAY MATERIAL FOR DEALERS

Each Frigidaire dealer also will receive without charge new display material to tie in his store with Frigidaire's nation-wide program—to help distribute WARTIME SUGGESTIONS booklets to store visitors and to merchandise the magazine advertising messages to his customers.

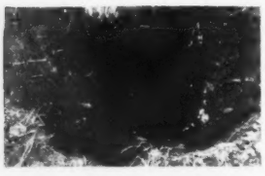
FRIGIDAIRE Division of GENERAL MOTORS CORPORATION • Dayton, Ohio

These are only part of our plans to help dealers benefit from this new program. Complete details are now being given to the Frigidaire Dealer Organization



ROUND 1

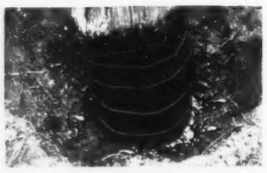
Dig earth from around pole to a depth of approximately 14 inches from the groundline. Then remove the loose decayed wood in the treatable zone.



ROUND 2

Apply OSMOPLASTIC by brushing or daubing on the cleaned surface from 6 inches above to 12 inches below the groundline level.

ROUND 3



Wrap the Osmose bandage around the treated area. This protects and retains the Osmoplastic until the Osmosalts penetrate into pole.

ROUND 4

Back-fill the hole and the operation is completed. The Osmoplastic protection adds many extra years service to standing poles.

Write for full information TODAY!

OSMOSE

WOOD PRESERVING COMPANY OF AMERICA, INC.

DENVER

SEATTLE • BUFFALO • SAN FRANCISCO

BOOKS *you may want*

PRINCIPLES OF ELECTRONICS, by Royce Gerald Kloeffler, first edition, 175 pages, illustrated, 169 figures, John Wiley & Sons, $2.50. This book is particularly valuable to the individual requiring a non-mathematical but basic practical knowledge of the theory, construction and application of electronic tubes. The first chapters introduce a brief discussion of the electronic theory, present-day conception of the atom with its complement of electrons, and the physical relationship between electric currents, potentials, electro-static and electro-magnetic fields.

Other chapters are devoted to a description of gaseous conduction, secondary emission, space charges and grid action which must be thoroughly understood by those attempting to determine the characteristics of the various types of electronic tubes. The theory of rectification, and the application of rectifier devices such as the selenium and copper oxide types, mercury vapor tube rectifiers of the ignitron and multianode mercury arc types are given adequate treatment. Other types of tubes, such as the hard and soft vacuum types and gas-filled types are described. Tube construction and the uses of diodes, triodes, and other multi-element tubes are clearly explained.

The reader is given a brief review of the quantum theory of light which is necessary to acquaint him with phenomena underlying the action of photo-electric, photo-voltaic and photo-conducting tubes.

Other special electronic devices such as beam power tubes, cathode-ray tubes and electron multipliers, their development and uses are described.

The last chapter is devoted to a description of a few of the circuits requiring the use of electronic tube devices in radio transmitters and receivers, power rectifiers and inverters, and industrial applications.—F. S. B.

TRANSIENTS IN LINEAR SYSTEMS, Vol. 1, by Murray F. Gardner and John L. Barnes (first edition), 389 pages, 6x9, illustrated. John Wiley & Sons, $5. Whenever a circuit is closed or opened, whenever an irregular or sudden change occurs in a mechanical or electrical system, transient effects occur. Although usually of short duration these effects frequently impose severe stresses upon equipment. The engineer, therefore, has found the study of transients very valuable in numerous design and application problems.

This book deals with the setting-up and solution of problems of transients in linear electrical, mechanical and thermal systems. Volume I is also restricted to lumped-constant systems.

Typical cases dealt with are: wave-form of a surge-voltage generator, response of a vacuum tube amplifier, governor action, recovery voltage and transient vibrations in mechanical systems.

Previous writers upon this subject, such as Bush in his *Operational Circuit Analysis*, have based their approach to transients upon Heaviside's operational calculus, adding the necessary mathematical rigor by a supplemental use of the Fourier and Laplace transformation methods. The present authors have based their work directly upon the Laplace transformation method. The results are more rigorous, somewhat less restricted in their applications, and tend to give a better picture of the relation between steady-state and transient conditions than do the more familiar Heaviside methods. A disadvantage is the greater depth of mathematical understanding required. Most of the detailed mathematical background, however, is developed and included in the book. New symbolization has been kept to a minimum.

The authors have adequately recognized the importance and difficulty of setting up the differential equations for a specific case by devoting one of the opening chapters entirely to this subject. Subsequent chapters introduce the Laplace transformation and theory of functions of a complex variable. The L-transformation method is then developed through its application to problems of increasing difficulty.

The reader already familiar with Heaviside's operational methods will find himself "at home" with the material presented, even though the methods are unfamiliar. The reader with a lesser previous introduction to transients is likely to find himself in an unfamiliar world of new concepts, requiring considerable study for their mastery. In either case this book is to be recommended for those desiring a thorough-going mathematical approach to transient studies.—W. R. J.

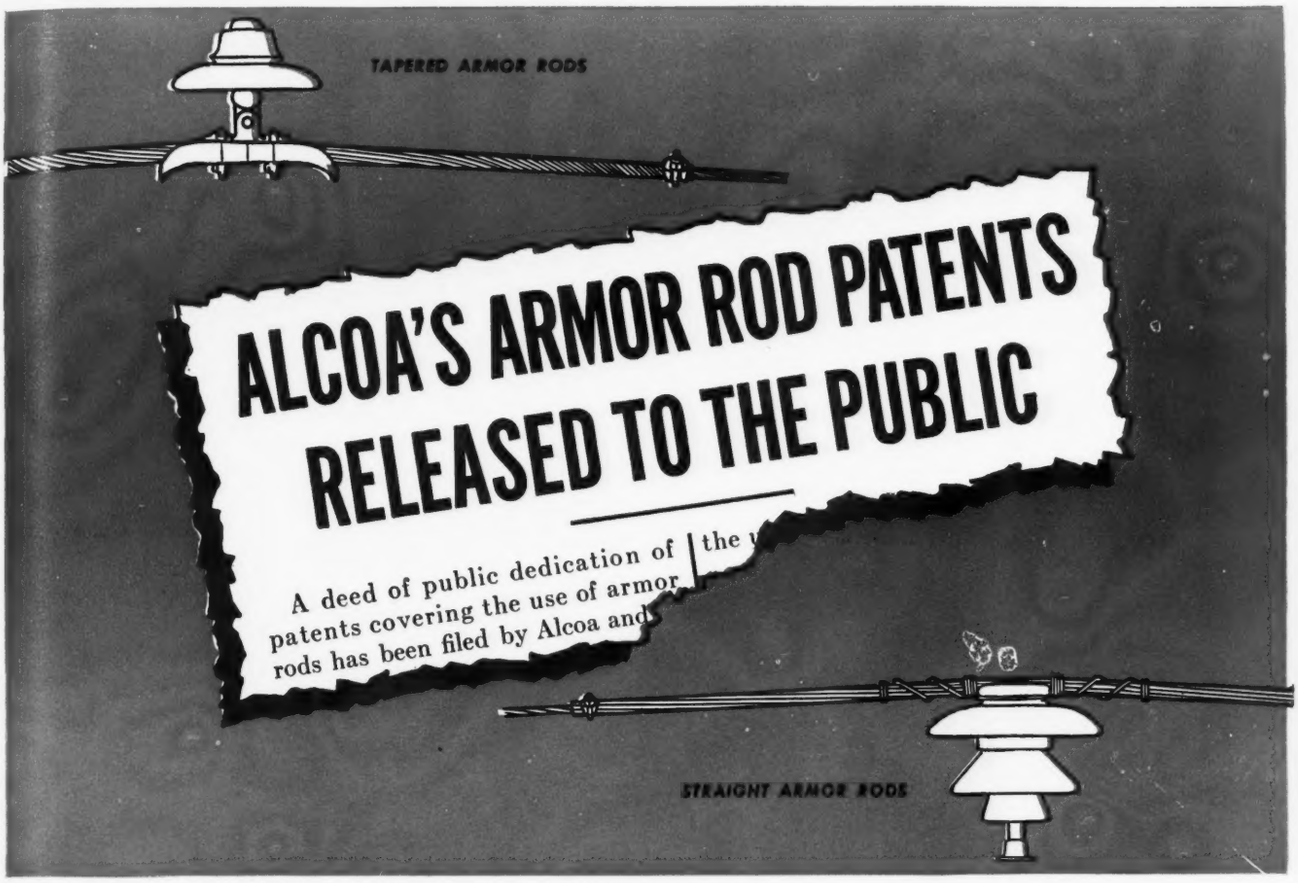
COMMUNICATION CIRCUITS, by Lawrence A. Ware and Henry R. Reed, 287 pages, John Wiley & Sons, $3.50. The basic principles of communication transmission lines and their associated networks are presented, covering the frequency range from voice frequencies through the ultra-high frequencies. Two chapters are devoted to Wave Guides and Coaxial Cables as applied to the UHF range. Throughout the text, wherever the problem at hand could be appropriately applied to UHF, this was done.

A rather extensive treatment of UHF transmission by means of rectangular and cylindrical wave guides and coaxial cables is presented inasmuch as the increasing importance of a knowledge of Maxwell's equations is recognized. The treatment presented therein is designed to lead the student into the elements of this theory as well as such subjects as filters, impedance matching, and wave guides. No attempt has been made, however, to present a complete treatment of any particular field.

A knowledge by the reader of calculus and the elements of alternating-current theory has been assumed by the authors.—C.T.M.

A GUIDE TO CATHODE RAY PATTERNS, by Merwyn Bly, 39 pages 8½ x 11, John Wiley & Sons, $1.50. Designed as a laboratory manual for those who use cathode ray oscilloscopes and are familiar with the fundamentals of their operation, this little booklet provides a series of sketches of typical screen patterns encountered in oscilloscope work. Covering items such as phase determination, frequency determination, modulation patterns, sine- and square-wave testing, resonance curves, and vacuum tube characteristics, the book provides approximately 170 sketches with brief, to-the-point discussions. It is not, however, a text book and the beginner will find a companion treatise of fundamentals desirable.

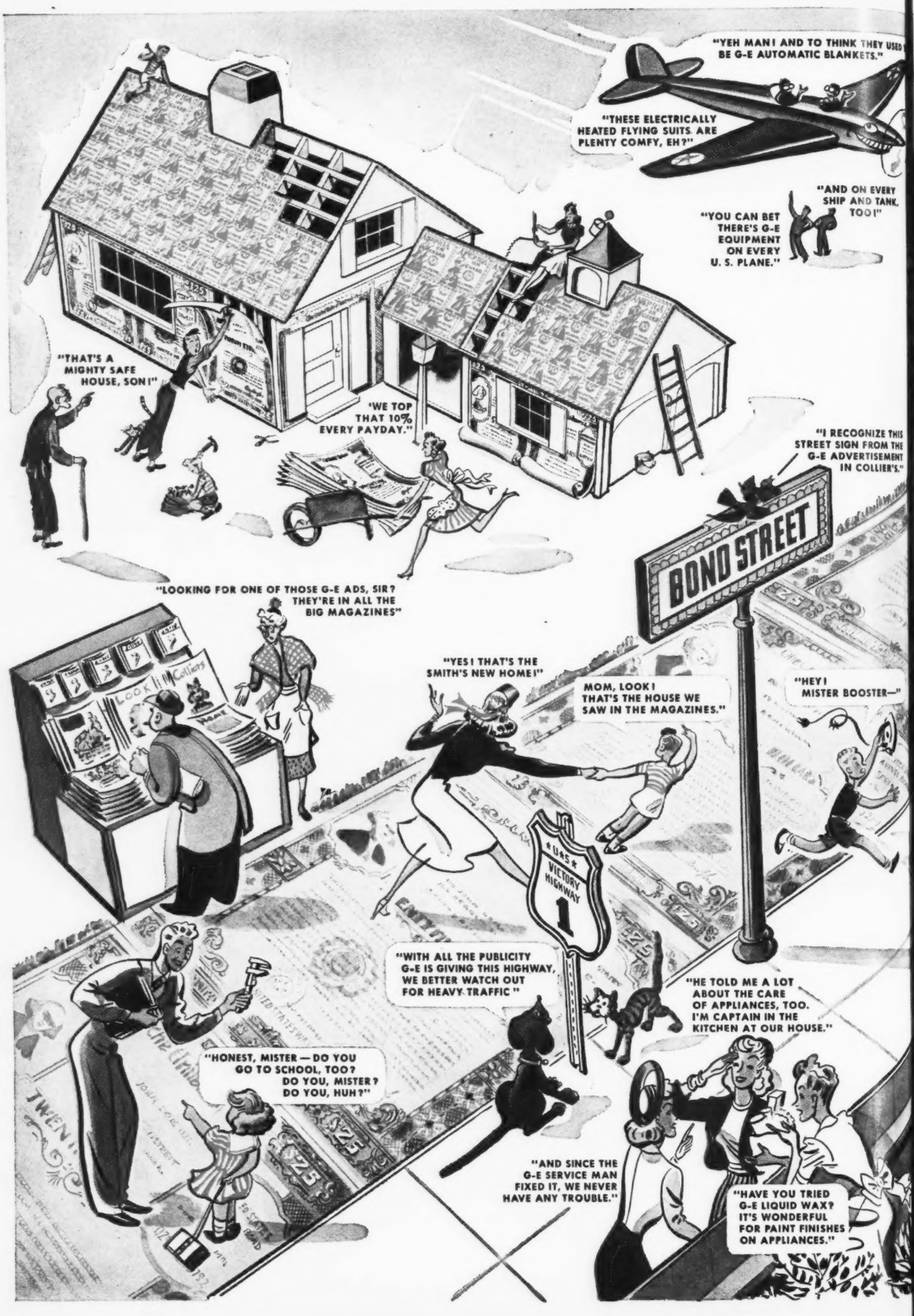
The author has thoughtfully included drawings of "perfect" half-sine waves of various amplitudes for quick checking of wave shape purity. The manual provides numerous circles with dotted axes for the convenience of the technician to draw reference images from his own experience.—T.M.B.


TAPERED ARMOR RODS
ALCOA'S ARMOR ROD PATENTS RELEASED TO THE PUBLIC
A deed of public dedication of patents covering the use of armor rods has been filed by Alcoa and
STRAIGHT ARMOR RODS

Desiring to serve the industry in the best possible way, we have released to the public patents covering the use of armor rods. This makes available to everyone, without the need for licensing procedure, a technique which, though originally developed for use with A.C.S.R., has since been employed on all kinds of conductors.

Armor rods resemble an extra layer of heavy strands covering the cable for a short distance each side of the insulators. Invented as protection against fatigue caused by resonant vibration, they increase the resisting moment of the cable at points of support. This distributes the stress due to bending, strengthens the cable at these critical points, and reduces its amplitude of vibration. The rods also protect the cable against burning by flashovers.

Most important right now, damaged conductors can be repaired with armor rods; thus often eliminating the need for new conductors. Where strands in a cable have been broken at an insulator, or burned by insulator breakdowns or flashovers, addition of armor rods usually makes the conductor "good as new." Alcoa engineers will gladly tell you how to employ armor rods on all kinds of power conductors. ALUMINUM COMPANY OF AMERICA, 2132 Gulf Building, Pittsburgh, Pennsylvania.


"YEH MAN! AND TO THINK THEY USED TO BE G-E AUTOMATIC BLANKETS."
"THESE ELECTRICALLY HEATED FLYING SUITS ARE PLENTY COMFY, EH?"
"AND ON EVERY SHIP AND TANK, TOO!"
"YOU CAN BET THERE'S G-E EQUIPMENT ON EVERY U. S. PLANE."
"THAT'S A MIGHTY SAFE HOUSE, SON!"
"WE TOP THAT 10% EVERY PAYDAY."
"I RECOGNIZE THIS STREET SIGN FROM THE G-E ADVERTISEMENT IN COLLIER'S."
BOND STREET
"LOOKING FOR ONE OF THOSE G-E ADS, SIR? THEY'RE IN ALL THE BIG MAGAZINES"
"YES! THAT'S THE SMITH'S NEW HOME!"
MOM, LOOK! THAT'S THE HOUSE WE SAW IN THE MAGAZINES."
"HEY! MISTER BOOSTER—"
U•S• VICTORY HIGHWAY 1
"WITH ALL THE PUBLICITY G-E IS GIVING THIS HIGHWAY, WE BETTER WATCH OUT FOR HEAVY TRAFFIC"
"HE TOLD ME A LOT ABOUT THE CARE OF APPLIANCES, TOO. I'M CAPTAIN IN THE KITCHEN AT OUR HOUSE."
"HONEST, MISTER — DO YOU GO TO SCHOOL, TOO? DO YOU, MISTER? DO YOU, HUH?"
"AND SINCE THE G-E SERVICE MAN FIXED IT, WE NEVER HAVE ANY TROUBLE."
"HAVE YOU TRIED G-E LIQUID WAX? IT'S WONDERFUL FOR PAINT FINISHES ON APPLIANCES."

FOR INFORMATION ON Nutrition · Food Preparation · Appliance Care
Laundering · Automatic Heating · Food Preservation · Home Canning
Consumer Consultation · Appliance Repair · Air Conditioning
WRITE TO THE GENERAL ELECTRIC CONSUMERS INSTITUTE
BRIDGEPORT.....CONNECTICUT
"I MUST HURRY HOME! IT'S TIME FOR FRAZIER HUNT AND THE G-E NEWS."
DOUBLE FEATURE
GENERAL ELECTRIC Presents
INTO THE WRINGER & OUT
Also
DON'T BLAME IT ON THE OVEN
FREE to All G-E Appliance Retailers FREE
HOUSEWIVES INVITED
"EXTRA! CLEVELAND AND ST. LOUIS OPEN NEW G-E SERVICE CENTERS."
WAR BONDS will build and equip NEW VICTORY HOMES tomorrow
BOOSTER BROS. GENERAL ELECTRIC
IF WE CAN'T SELL YOU NEW ONES...WE'LL FIX UP THE OLD ONES
"MY WIFE SENT FOR SOME OF THESE BOOKLETS —AND SHE SAYS THEY SURE ARE HELPFUL."
WARTIME HELPS for Homemakers
U.S. MAIL
'MINNIE GOT SOME TOO. SAYS G-E CONSUMERS INSTITUTE SURE KNOWS THE ANSWERS."
CONSUMERS INSTITUTE MAIL
"PROPER CARE OF ELECTRIC APPLIANCES IS JUST PLAIN HORSE SENSE!"
"I POSED FOR THIS ON MY LAST FURLOUGH."
"IT'S JUST LIKE YOU, JIM! AND EVERYBODY SAW IT IN LIFE AND THE POST MAGAZINES."
SCRAP IS POWER
YOU HELP
ROY CARLEY

The Red Cross has Problems like your own

—*of Planning*

Your Red Cross operates a vast planning program to enable it to be ready for any disaster or emergency anywhere—whether it comes in the Americas, Europe, Australia, Asia, or Africa.

—*of Organization*

Your Red Cross is responsible for the smooth operation of 3,750 chapters and 6,000 branches, all engaged in the same enterprise of helping all who need help.

—*of Personnel*

Your Red Cross has tripled its staff since Pearl Harbor and has had to enlist the aid of and train over 6,000,000 volunteers in the principles of First Aid, Water Safety, Accident Prevention, Home Nursing, Nutrition, Nurse's Aideing, Mass Feeding, Motor Mechanics, and other subjects allied to our country's war effort.

—*of Production*

Your Red Cross is not only one of the world's foremost purchasers of supplies, but it has the immense distribution job of collecting millions of items from 10,000 different communities in the United States, assembling and storing them, and then shipping them to practically every country in the world. Last year your Red Cross shipped some $60,000,000 worth of food, clothing, and medical supplies to over 20,000,000 homeless people in foreign countries.

—*of Finance*

Your Red Cross, whose war-time and post-war expenses will run well into hundreds of millions, must account to the public for every penny it collects and puts to work. Its accounts are audited annually by the U. S. War Department.

The Red Cross faces the same problems as are in your business. With your support it can successfully meet them.

The Second War Fund is greater than the First, but no greater than the increased needs.

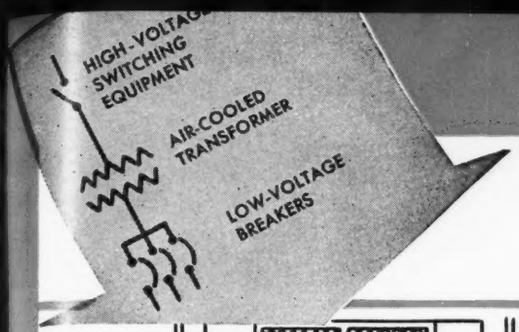
Business men can help with time and with money, as organizations and as individuals.

March is the Red Cross month . . . Cooperate with your Red Cross Chapter.

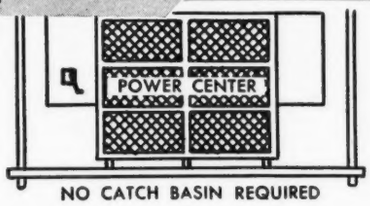
Your Dollars help make possible the

AMERICAN RED CROSS

This space contributed by the Publisher



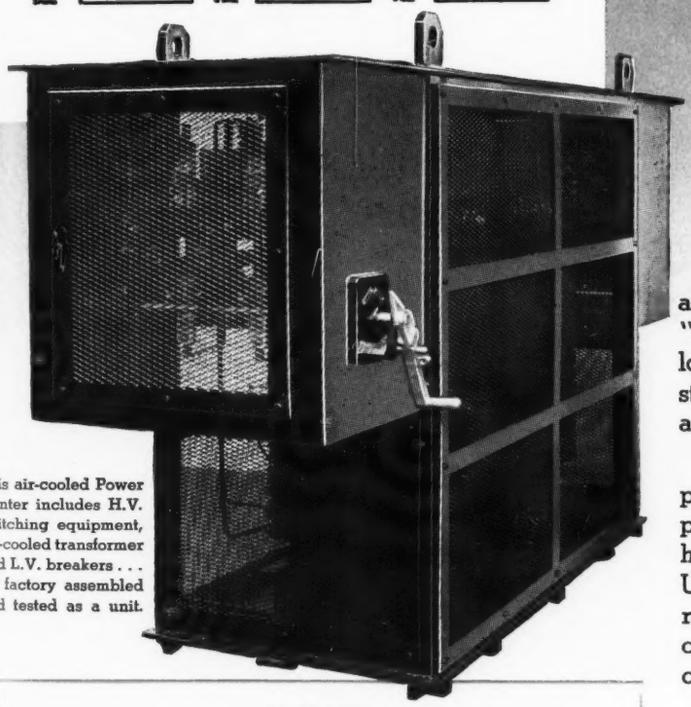
Nearer the Load Center
to improve voltage regulation



NO CATCH BASIN REQUIRED

. . . and power anywhere you need it *in a hurry*

with Westinghouse Power Centers



This air-cooled Power Center includes H.V. switching equipment, air-cooled transformer and L.V. breakers . . . all factory assembled and tested as a unit.

Power centers are available for installation anywhere . . . indoors or outdoors! They are "Packaged Power" to supply concentrated loads. Unit construction saves man-hours in installation and production time because all units are factory assembled and tested.

Westinghouse Power Centers have been applied in all types of Industrial Plants and are proving ideal in office buildings, apartment houses, air bases, Navy Yards, and Army Camps. Used near the load center, they improve voltage regulation and often save more than 75% of the copper otherwise required for long secondary cables.

Power Centers are available with oil, Inerteen, or air-cooled transformers; high-voltage fuses, disconnect switches or selector switches; low-voltage panelboards, breakers or throat-connected, low-voltage switchgear.

Air-Cooled and Inerteen Power Centers can be mounted overhead to save floor space . . . with perfect safety to workmen below.

Ask your Westinghouse representative for complete information, or write Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-70400

FEATURES

- Factory assembled and tested
- Low installation cost
- Less copper
- Better regulation
- Safe
- Attractive
- Minimum space
- No vaults required*

ADDED ADVANTAGES OF AIR-INSULATED POWER CENTERS

- Fire hazard is eliminated. Transformer is completely air-cooled. No cooling or insulating liquids of any kind.
- Explosion hazard is eliminated.
- Toxic gas hazard is eliminated.
- Inspection and maintenance are reduced to a minimum.

**National Electric Code permits air and Inerteen-insulated units to be installed indoors without fireproof vaults.*

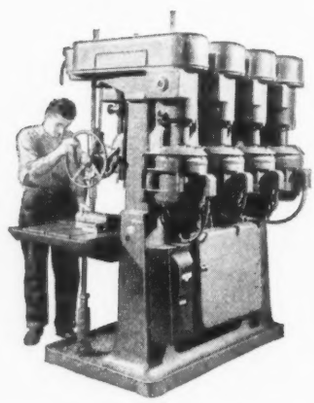
Westinghouse
POWER CENTERS

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

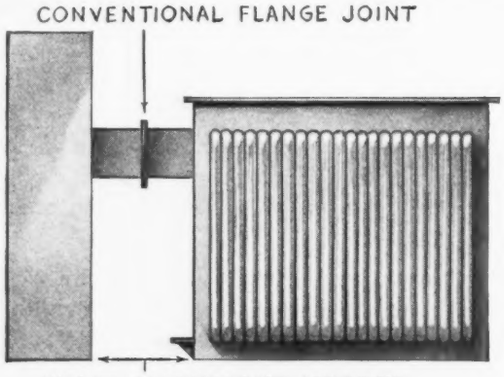
Standardized

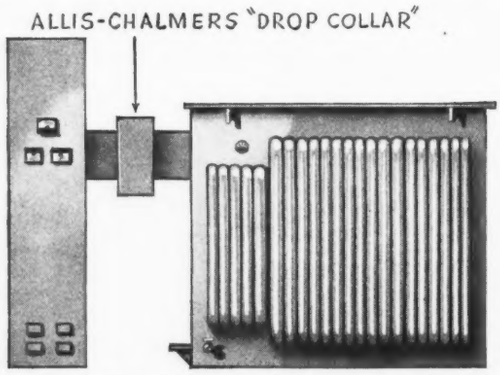
New Allis-Chalmers Standard Load Center Unit Substations
They save installation time, save space, save losses... help

Savings on Deliveries! Because Allis-Chalmers Load Center Unit Substations have been standardized, there are no "specials" that hold up production by causing delays on the drafting board or in the shop. Yet these units are flexible to meet your exact requirements.



Savings in Production! Eliminating low voltage runs gives you lower losses, improved regulation, better motor and lamp performance in your plant.



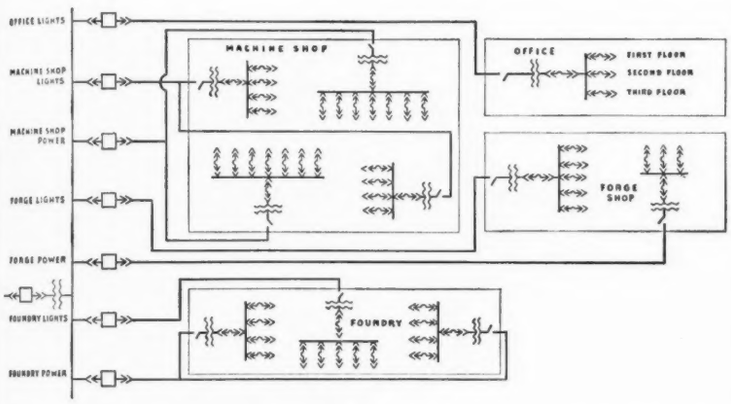


Savings in Installation! No exact alignment of the equipment is required. The Allis-Chalmers "drop collar" is used on outdoor and on the high side of load center units. On the low voltage side of load center units, flexible-cable connection is made inside switchgear cubicle. And because Allis-Chalmers Load Center Unit Substations are factory-assembled, there's no wiring to be done in the field. Nor is it necessary to construct any special foundation or fireproof vaults.

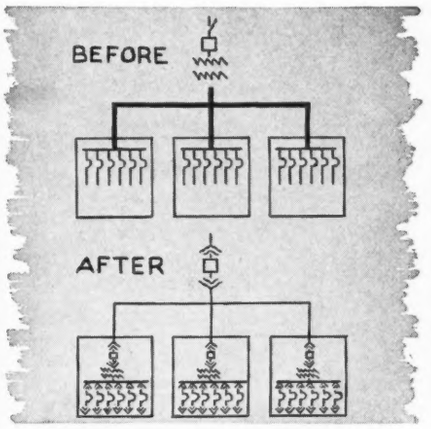
ALLIS-CHALMERS

for Savings!

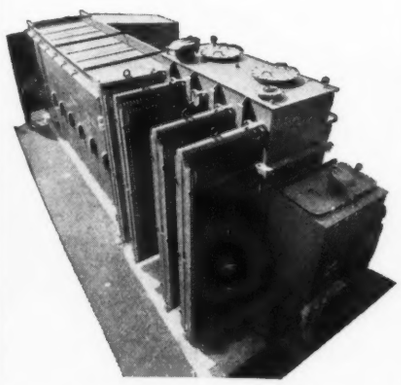
save drafting board delays, giving you faster deliveries.
you save important amounts of copper for the war effort!



Savings During Blackouts! Load Center Unit Substations make it easier to use separate lighting and power circuits. Lamp flicker is reduced . . . and blackout control of lighting can be achieved without killing power circuit and interrupting production.



Savings in Copper! Installed right at the machines they serve, load center unit substations eliminate long runs of heavy secondary cable.



Savings in Space! Compact design of Allis-Chalmers outdoor Unit Substations saves space. If load center shifts, these packaged units are easier to move.

All this — and flexibility, too!

THE savings you make with standard Allis-Chalmers Load Center Unit Substations add up to a big wartime *and peacetime* engineering advantage. And there's no penalty attached...

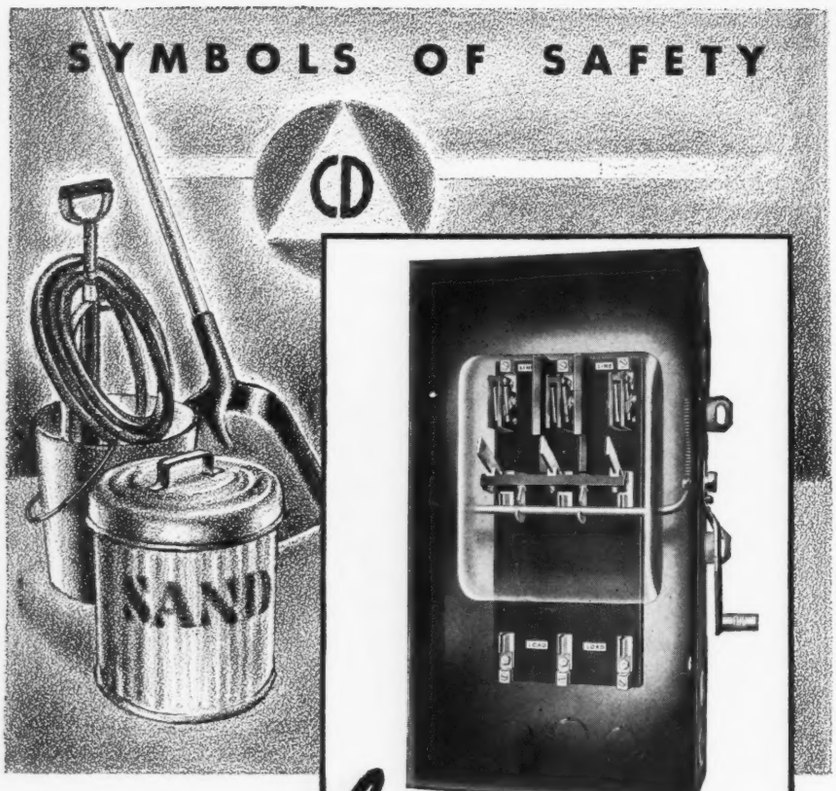
For even though these units have been standardized, you still get your choice of a wide variety of high and low voltage connection. On the high side you can have disconnect switches, oil fuse cutouts, metal-clad switchgear, direct connection to roof bushings, or throat connection to bus run. On the low side, stationary or drawout air breakers can be electrically or manually operated. Transformers can be Chlorextol-liquid-filled or dry-type.

To learn why buying Standard Load Center Unit Substations is smart buying for *you,* call the district office near you. Or write ALLIS-CHALMERS MFG. CO., MILWAUKEE, WIS.

A 1572

UNIT SUBSTATIONS

WE WORK FOR VICTORY WE PLAN FOR PEACE



Federal Rolarc SAFETY FACTORS

PREVENT MANPOWER SHORTAGES

Industrial accidents are one reason for manpower shortages. And uncontrolled arcing is one cause of industrial accidents. That's why special safety features are incorporated in Federal Rolarc Safety Switches to control and reduce dangerous arcing to an *absolute minimum* . . . and to increase production by eliminating delays and accidents caused by switch failure.

The parallel cylindrical rollers which "dam up" and snuff the arc give these 575 Volt Rolarc Safety Switches many added advantages. This new method of arc control lengthens switch life — conserves war vital copper — saves valuable time and priceless manpower. Follow the leaders — for extra service and safety switch to Federal!

For Complete Rolarc Data

Write for Bulletin 42-12. Contains all the essential facts on the 575 Volt Federal Rolarc Safety Switch.

SAN FRANCISCO 1264 Folsom St. UNderhill 2367-8
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FEDERAL ELECTRIC PRODUCTS COMPANY
64 PARIS STREET, NEWARK, N. J.

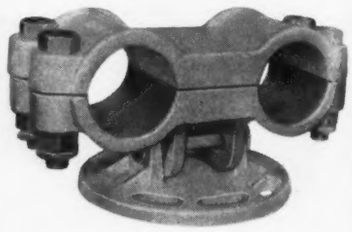
PANELBOARDS • SWITCHBOARDS • SAFETY SWITCHES • CIRCUIT BREAKERS

PRODUCTS

that are news

Bus Support Clamp (400)

Delta-Star Electric Co. has announced an expansion-type bus support clamp. These single or double bus support clamps are available with provisions for longitudinal movement of bus conductors from expansion or contraction. Bus fittings have rollers



permitting ⅝ in. longitudinal movement of bus on either side of center line or a 1¼ in. total movement. Use of this sliding type of fitting is said to reduce possibility of insulator breakage on long bus runs.

Glass Fiber Cable Hanger (401)

Westinghouse Electric & Mfg. Co. has developed a glass fiber cable hanger for use in mines, shipyards and on construction projects. This strap is impervious to moisture and will not rot, stretch or shrink, the manufacturer reports. Glass fibers are protected and the insulation value increased by heat-resisting varnish treatment.

Standard size hanger is 14 in. long x 1½ in. wide. A one-half inch metal grommet in each end permits nailing to wooden pillars.

Light Signal (402)

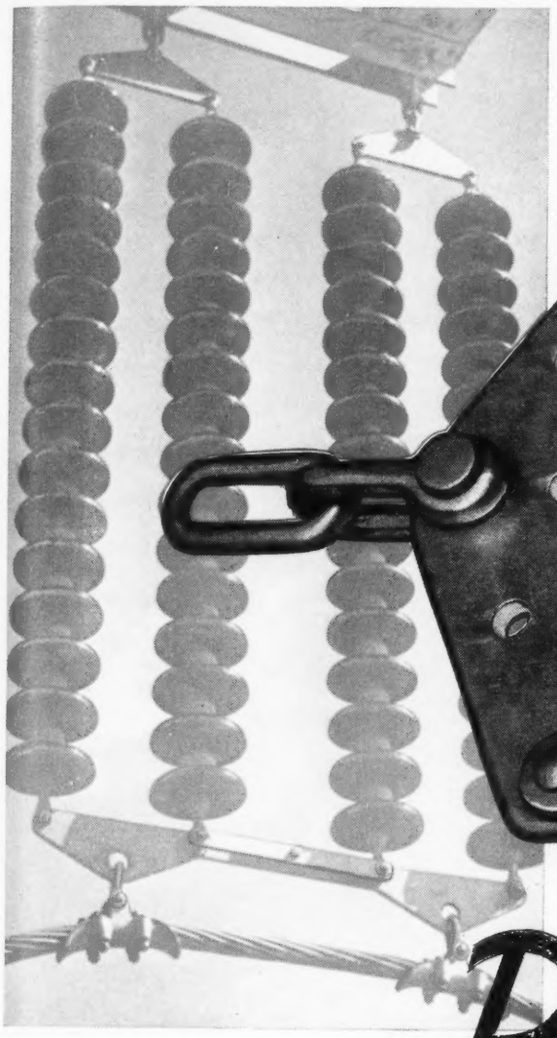
Signalette, a light signal that operates by fluorescent reflection of "black light," has been announced by Littelfuse Inc. Developed for aircraft use, the manufacturer reports that it can be used in other fields as well. Indication is entirely by reflected light and radio activity. The unit operates by fluorescence under "black light" from the usual sources within aircraft; a radium-active fluorescent paint used on the indicator shows signals in total darkness. Uses 1.5 watts: overall length 2 5/32 in.

Radio Transformer (403)

An armored-insulation high-voltage plate supply transformer has been announced by Acme Electric & Mfg. Co. It is rated at 3,300 volts, 1.8 amp. secondary; is intended for transmitter service for d-c rectifier systems. According to the manufacturer, it is particularly suited for continuous service of radio transmission.

Blueprinting Machine (404)

A blueprinting machine utilizing eight 150-watt incandescent lamps has been designed by Victoray Corp. The manufacturer claims that no experience is required to operate the unit and that cost of prints is approximately one cent per square foot.



Specify Die-Forged

For when you specify die-forged you specify full radius round corners and edges—better corona performance and superior strength. In case of failure of one insulator string, the rounded corners allow the fittings to rotate without interference.

Why not get the full story on BTC yoke sets? Double, triple or special design, you'll find full information in the BTC Hi-Line Reference Book. Write for your copy.

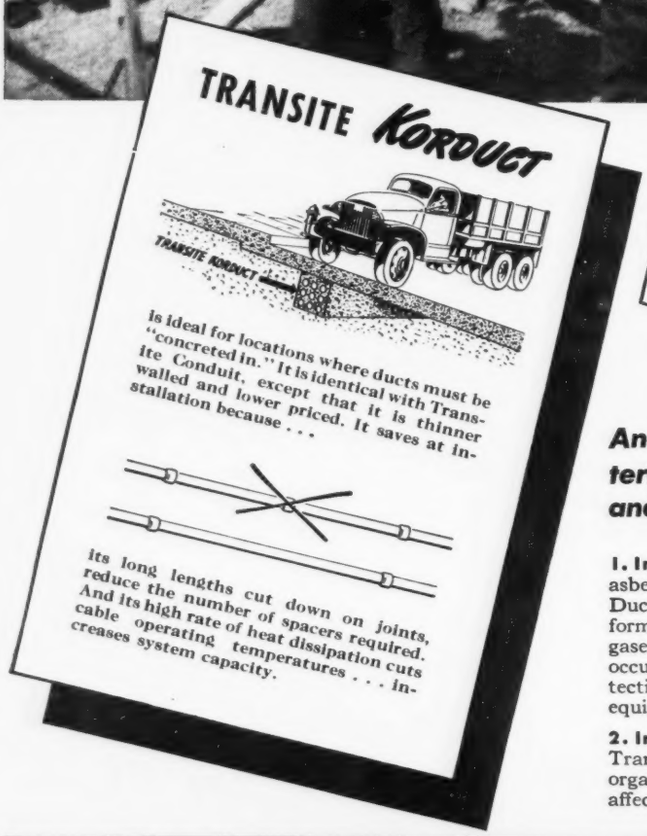
Through Your Insulator Manufacturer Only

BTC

Drop Forged Hi-Line Hardware

THE BREWER-TITCHENER CORPORATION
CORTLAND, NEW YORK

WHAT'S THE DIFFERENCE BETWEEN TRANSITE *CONDUIT* and TRANSITE *KORDUCT*?


TRANSITE KORDUCT
is ideal for locations where ducts must be "concreted in." It is identical with Transite Conduit, except that it is thinner walled and lower priced. It saves at installation because . . .
its long lengths cut down on joints, reduce the number of spacers required. And its high rate of heat dissipation cuts cable operating temperatures . . . increases system capacity.

TRANSITE CONDUIT
is for use underground or on exposed locations without a concrete casing. It can't rust or rot . . . resists weather and corrosion . . . remains unaffected by smoke or ordinary fumes . . .
TRANSITE CONDUIT
Its uniform strength and durability mean that it holds its true form under earth loads and traffic pressure. And it is low in cost . . . more economical in service than other materials of comparable strength and corrosion-resistance.

And here are characteristics that Transite Conduit and Transite Korduct have in common . . .

1. Incombustible . . . Made of asbestos and cement, Transite Ducts won't contribute to the formation of dangerous smoke, gases or fumes. When burnouts occur, they give maximum protection to adjacent cables and equipment.

2. Immune to Electrolysis . . . Transite Ducts are entirely inorganic, non-metallic, cannot be affected by electrolysis.

3. Smooth bore . . . Cable pulls and replacements are easier . . . damage to sheathings is minimized.

4. Easily installed . . . Their combination of light weight, long lengths and quickly assembled couplings speeds up work.

For details and specifications, write for Data Book DS-410. Johns-Manville at Los Angeles, San Francisco or Seattle.

JM Johns-Manville

TRANSITE DUCTS

TRANSITE KORDUCT— for installation in concrete

TRANSITE CONDUIT— for exposed work and installation underground without a concrete encasement

This Advertisement, in 4 colors, appears in *Collier's* April 3, *Life* April 5, *Ladies' Home Journal* May, *House Beautiful* March, *American Home* April, *Better Homes & Gardens* June, *Bride's* Magazine.

We're On The BOND WAGON NOW!

WE'RE rolling down that good old Victory road—full speed ahead! We figure the sooner we put every last cent we can in War Bonds, the quicker this war will be over—and we'll be able to have that new Hotpoint Electric Kitchen we want! That's why Joe and I are stretching the budget to invest even *more* than ten per cent of his pay in War Bonds. The more money we have in Bonds, the more of that thrifty, time-saving equipment we can buy for our Hotpoint Electric Kitchen when Hotpoint makes home appliances again instead of war materials!

Some Day We'll Have The ELECTRIC KITCHEN That Bonds Bought!

FOR HOMES COSTING $6,000. **The Meadow Lark Kitchen** illustrated is designed for homes costing as little as $6,000 and is completely electric, with Hotpoint Range, Refrigerator, Dishwasher, Sink and Hotpoint Steel Cabinets.

FOR HOMES COSTING AS LITTLE AS

$4,000

Hotpoint Electric Kitchens including Range, Refrigerator, Sink and Steel Cabinets have been installed in numerous homes costing only $4,000.

Tomorrow Is Worth Saving For

THERE'S a whale of a lot of incentive for you to make every sacrifice you can today! For after the war—with all the new appliances that are being perfected—the homes of America will be *finer* and cost *less* than you can imagine! Cooking will be done by Hotpoint Electric Ranges that require no watching. Electric refrigeration will be improved beyond belief... All these miracle-working conveniences can be yours —when the war is won. So speed the day of Victory—save wherever possible in order to buy more and more War Bonds.

BUY WAR BONDS TODAY—An Electric Kitchen Tomorrow!

• Kitchen hours will be cut down considerably with an automatic Hotpoint Electric Range to do the pot-watching! Vitamins and minerals will not be cooked away!

• Built to provide plenty of storage space—and keep foods at flavor peak far longer—the Hotpoint Electric Refrigerator will save time and money!

• A Ho
Dishwas
your mos
household
your chor

The Cost of a Hotpoint Electric Kitchen Averages About 10% of Home-B

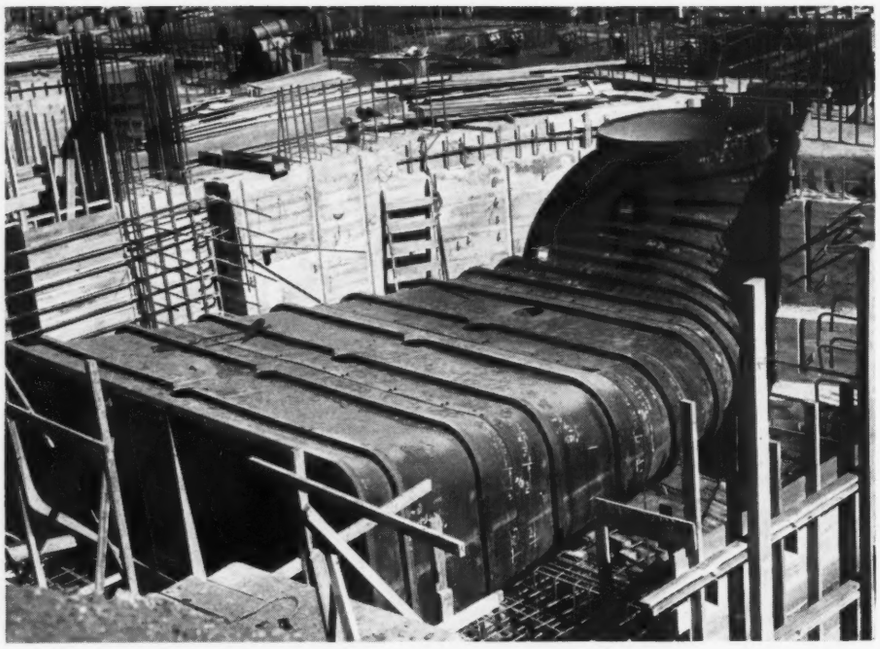
ELECTRIC Hotpoint

Now a Full Scale Offensive... Hotpoint's National War Bond Advertising Campaign

★ Stronger than ever this year! In the first half of 1943, 27 full color, full page advertisements are selling *your* community this idea: "Buy War Bonds Today—An Electric Kitchen Tomorrow!" They appear in the following 12 magazines: *Collier's, Life, Ladies' Home Journal, Country Gentleman, Farm Journal, Electricity on the Farm, American Home, Better Homes & Gardens, House Beautiful, Bride's, House Beautiful Maintenance & Building Manual, House Beautiful Guide for the Bride.*

Hop on the Hotpoint Bond Wagon! Ask your Hotpoint distributor or factory representative for the 1943 plan book, which tells you how you can support this great forward looking program in your own advertising. Edison General Electric Appliance Company, Inc., 5612 West Taylor Street, Chicago, Ill.

For outstanding achievement in War Production



Here the Water Will Flow from a PELTON TURBINE

After passing through the runner of a Pelton Turbine, the water flows through this Pelton-built draft-tube liner into the tailrace.

The design of the draft-tube liner must be right—to permit water running off with the least turbulence. Pelton engineers are good at solving these problms, too.

The above photograph shows one of four Pelton installations at the Pit No. 5 project, Pacific Gas and Electric Company. Each Vertical-Shaft Pelton Reaction-Type Turbine, will develop 50,000 H.P. at 300 R.P.M. under an effective head of 587 feet.

THE PELTON WATER WHEEL COMPANY

Hydraulic Engineers

2929 NINETEENTH ST., SAN FRANCISCO

EXCLUSIVE WESTERN REPRESENTATIVES for Baldwin-Southwark Division of Baldwin Locomotive Works, Baldwin-De La Vergne Sales Corp., Woodward Governor Co. and Cone Valve Division, Chapman Valve Mfg. Co.

120 Broadway NEW YORK

Paschall Station PHILADELPHIA

BLW THE BALDWIN GROUP

PELTON

Subsidiary of THE BALDWIN LOCOMOTIVE WORKS

for FASTER - BETTER WELDING
.....TIREX SUPER *Flexible* CABLES

TIREX Welding Cables are designed for use on welding jobs where speed is vital and results count. By using cables specially designed for welding equipment, time can be saved and output can be increased on maintenance, repair or new construction jobs.

The outstanding feature of TIREX Welding Cables is super-flexibility—obtained not only by employing a multitude of fine copper wires in the stranded conductor but also by the use of a specially applied cotton braid separator between the stranded conductor and the rubber jacket. This feature of super-flexibility, plus the exceptional electrical and physical properties of special TIREX rubber compound used, makes TIREX Welding Cable the ideal electrode cable.

RUBBER SHEATHED WELDING CABLE
Super-Flexible, Single Conductor

A. W. G. or M. C. M.	No. of Strands #34	O. D. Inches	Net Pounds per 100 ft.	Welding Current Capacity Amperes	Voltage Drop Max. Current Volts per 100 ft.
8	420	.39	10	50	3.71
6	686	.40	13	75	3.58
4	1078	.50	20	100	3.18
3	1372	.50	23	150	3.70
2	1715	.56	29	200	3.92
1	2156	.63	36	250	3.88
1/0	2695	.68	43	300	3.72
2/0	3381	.75	54	375	3.68
3/0	4263	.82	67	450	3.51
4/0	5341	.90	83	550	3.41
250	6321	.95	96	600	3.12
300	7595	1.03	115	650	2.80

All TIREX CABLES - for the duration - conform to government regulations controlling the use of copper and rubber. If you need cables to keep welding equipment going on war work you can avoid cable failures and replacements, save copper and the other critical materials and get the results you want with TIREX.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

ARMY E NAVY

Simplex
WIRES and CABLES

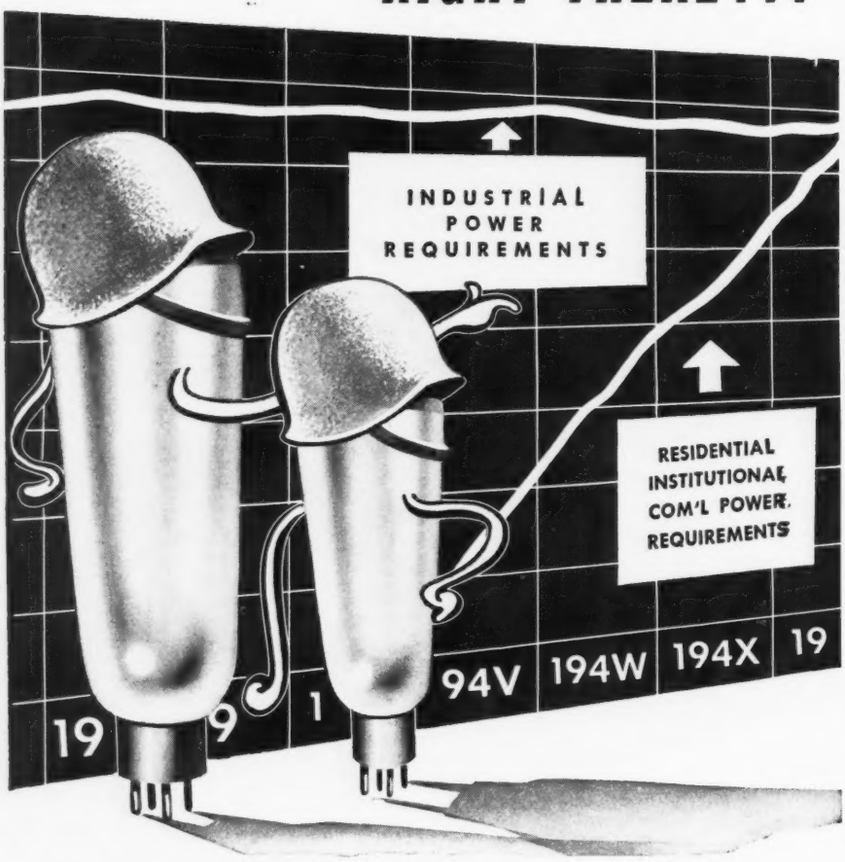
PACIFIC COAST OFFICES

390 Fourth St., San Francisco, Calif.

910 East Third St., Los Angeles, Calif.

503 Polson Bldg., Seattle, Wash.

"WE'LL PUT ANOTHER MOUNTAIN RIGHT THERE..."



Electronics-at-war is landscaping the Future

WITH the Electronics Industry in this war today up to its neck, that "mountain" of new power requirements it's going to create is still just a curve on a graph of the future. But in the very process of helping to win this war, Electronics is learning the new tricks that will change that hypothetical "mountain" into actual new power *demands*. For with Victory, plenty of those tricks will be put to work in America's homes, schools, offices, factories — ultra-high frequency heating and cooking—fully automatic air-conditioning and daylighting — two-way radio and television.

Are you planning now to meet the changes Victory and Electronics will bring to the power distribution scene? If you are, you'll be glad to learn that Roebling's Development Engineers are looking in that direction, too. Doing more than just looking, in fact. We're making lots of better wires and cables right now to meet Victory's tough specifications. Those very products —Paper-insulated Power Cable, Armored Parkway Cable, Roevar Magnet Wire—are going to help you meet your "landscaping" problems after Victory. For powering war production today, for landscaping the future tomorrow, you can rely on Roebling for your electrical wire and cable needs.

JOHN A. ROEBLING'S SONS COMPANY
OF CALIFORNIA
San Francisco • Los Angeles • Seattle • Portland

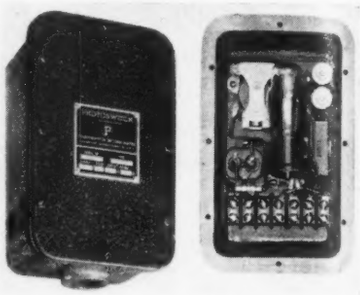
JAR ROEBLING **ROEBLING**

ELECTRICAL WIRES AND CABLES

Electronic Level Controls (405)

A series of electronic level controls has been designed by Photoswitch for hazardous location mounting. Models are available for high- and low-level control. Each is furnished as a complete unit in a vapor-proof cast iron housing for direct tank installation.

A one-inch nipple screws into the hub at the bottom of the control housing and is

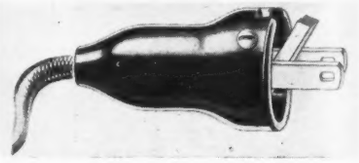


screwed into a one-inch flange on top of the tank. From the control, a probe rod projects through the nipple and into the tank to the desired depth. The probe is supplied as standard in one-half inch diameter brass but other metals are available if required. High-level control is accomplished when liquid rises and contacts the probe tip; low-level control when liquid drops below the probe tip.

Relay connections are those of a single-pole double-throw switch. The relay contacts are rated at 1,000 watts a-c. Available for operation on 230, 208 or 115 volts a-c, 60 cycles.

Circuit Breaking Plug (406)

Hopax Industries, Inc., is manufacturing a circuit breaker plug, which it claims provides protection against overload and stalling for fractional horsepower motors, power tools, etc., and protects fluorescent lighting units in case of short circuit. According to the manufacturer, individual protion is provided each piece of equipment



on a circuit, allowing a faulty unit to be removed and repaired without hampering production.

A small red lever breaks the connection on a faulty piece of equipment. The plug does not have to be renewed after the circuit has been broken, but is reset by raising and lowering the lever, it is stated. The plug is actuated by heat, providing a time delay feature, which assures that current will be stopped only when conditions become dangerous.

Shade Holder (407)

Commercial Reflector & Mfg. Co. has designed a clamp-type shade holder to replace the set-screw type. The manufacturer claims that the holder makes a rigid connection between receptacle and shade. A single screw is used to fasten and unfasten the holder. Three types are available for varying shade sizes and lamp wattages.

- JACKS
- TACKLE
- ROPE
- SHOVELS
- PLIERS
- CUTTERS
- LEATHER
- RUBBER

New HANDY GUIDE TO LONGER TOOL LIFE

Helps to save time...avoid breakdowns...conserve materials

Here's a convenient, practical handbook that tells how to get the greatest service out of tools that may be irreplaceable for the duration. On more than thirty separate items, it gives suggestions for use, advice on adjustment, lubrication, storage, and the like.

Pocket size, with durable stitched binding, this new handbook fits the needs of everyone responsible for care and servicing of tools, for employee training, and for setting up standard practices. It was prepared with the cooperation of leading manufacturers of these supplies as a part of GRAYBAR'S complete service "from the top of the pole to the bottom of the hole."

For your copy of "Wartime Care" just call your local GRAYBAR Representative or use the coupon below. Remember, too, that there's no better Procurement Advisor on difficult-to-get new line tools and supplies than your GRAYBAR Man.

Graybar

IN OVER 80 PRINCIPAL CITIES

JUST MAIL COUPON

GRAYBAR ELECTRIC COMPANY
Dept. W, Graybar Building, New York

Gentlemen: Please send me a free copy of your new 32-page handbook "Wartime Care of Line Construction and Maintenance Tools."

*Name*_____

*Company*_____

*Address*_____

*City and State*_____

all clear

COMPLETE 180-DEGREE "DROP-OUT" ACTION OF NEW WESTINGHOUSE DBA POWER FUSES . . .

- **Assures Positive Isolation of Fault**
- **Signals Clearly Which Fuse Has Operated**

Arcs are effectively extinguished with the new Westinghouse DBA Boric Acid Fuse. Within ½ cycle, the arc is quenched by "De-ion" action. Full "Drop-Out" action then makes isolation positive. The top of the fuse tube is thrown completely clear to place maximum air space between live and faulted circuits. No burning or arcing can occur at contacts.

The "Drop-Out" action not only signals that the circuit is "All Clear", but also tells at a glance which fuse has blown. In many types of multi-circuit installations, this saves valuable time.

Ratings: DBA boric acid power fuses are available in a complete line from 7.5 to 69 kv, and from ½ to 200 amperes, with interrupting capacity from 8500 amperes at 7.5 kv to 4000 amperes at 69 kv.

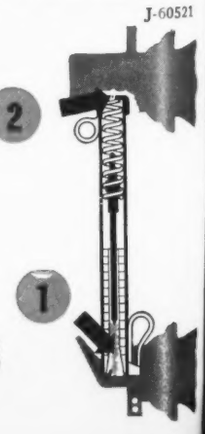
For complete information, call your Westinghouse Office or write for B-3198, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

J-60521

Double Action gives COMPLETE ISOLATION

1. **"DE-ION" ACTION** instantly quenches arc inside boric acid tube. Fuse melts, allowing spring to withdraw rod and lengthen arc. Resulting water vapor "De-ionizes" and blows out arc.

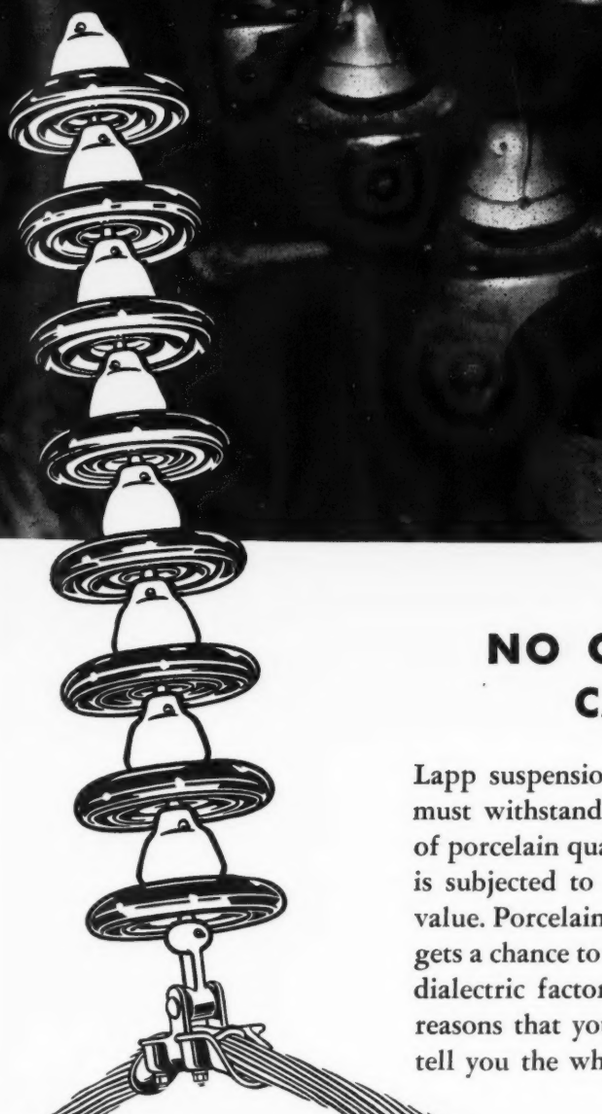
2. **"DROP-OUT" ACTION** removes the fuse unit from circuit and isolates the faulted equipment.



WESTINGHOUSE

Westinghouse POWER FUSES

PLANTS IN 25 CITIES... OFFICES EVERYWHERE



NO QUESTIONABLE PORCELAIN CAN SURVIVE THIS TEST

Lapp suspension insulator units, before being approved for shipment, must withstand the Overpotential Test, the industry's most severe test of porcelain quality. Its rim immersed in oil to prevent flashover, the unit is subjected to 60 cycle current at voltage higher than rated flashover value. Porcelain not up to the Lapp standard, punctures in this test, never gets a chance to fail on your lines. Units that survive are assured a definite dielectric factor of safety. The Overpotential Test is one of the many reasons that you do better with Lapp insulators on your lines. May we tell you the whole story? Lapp Insulator Co., Inc., LeRoy, N. Y.

Lapp

ARMY (E) NAVY

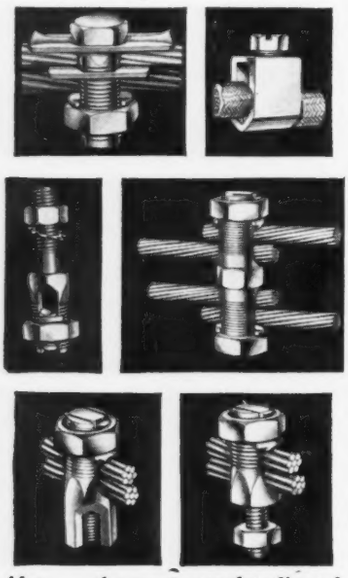
Better Porcelain • Better Insulators

"All SIZES of SERVICE CONNECTORS—

from No. 10 to 1,000,000

and All TYPES"

You can find exactly the service connector you need, in the Penn-Union Catalog: Yoke-and-Nut type, in a complete range of sizes . . . Service Entrance connectors . . . Service Post and Special connectors in wide variety.



Also . . . the most complete line of Tee Connectors, Cable Taps . . . Straight, Parallel, Elbow and Cross Connectors . . . Bus Supports, Clamps, Spacers . . . Grounding Clamps, Terminal Lugs . . . practically every good type.

NORTHWESTERN AGENCIES
2411 First Ave., Seattle, Washington

F. M. NICHOLAS CO.
1123 Harrison St., San Francisco

KENNETH ANDERSON CO.
334 East 4th St., Los Angeles

Penn-Union Electric Corp., Erie, Pa.

PENN-UNION
Conductor Fittings

Reflector Latch (408)

Sylvania Electric Products, Inc., has designed a "Captive Latch," spring-type fastening for use with its new line of composition reflector fluorescent fixtures to hold the reflector securely to the top housing. The latch is an integral part of the top housing and cannot become loose and drop out, according to the manufacturer. Only a quarter turn is required to remove the reflector. Inconspicuous, the latch does not affect appearance or efficiency of reflector surface, it is stated.

Emergency Lighting (409)

Electric Storage Battery Co. has announced a new Exide emergency lighting unit which requires no fixtures or wiring other than plug-in connections to an a-c supply. Designed for wartime service, it throws a beam of light 50 ft. wide a distance of 150 to 200 ft., covering an area of 7,500 sq. ft. It is a self-contained unit weighing 47 lb. and can be moved during fire, accident or other disaster. The unit operates automatically and only maintenance required is occasional adding of water, according to the manufacturer. Recharging is done automatically by trickle charge. Unit measures 16½ in. long, 6¼ in. wide and 18 in. high.

Stitching Wire (410)

American Steel & Wire Co. is manufacturing a stitching wire which permits binding various types of materials much as pieces of paper are stapled by an ordinary desk stapler. According to the manufacturer, it is particularly well adapted to fastening rubber, plastics, fiber board, laminated wood and other construction materials to stainless steel or aluminum. It is said to permit stitches to be made at the rate of several hundred per minute and to have a guaranteed minimum tensile strength of 290,000 lb. per square inch. The wire will penetrate stainless steel of .030 in. thickness; duralumin of .040 in. or aluminum of 0.60 in.; softer materials can be penetrated to a thickness of ¾ in.

Connectors (411)

Heavy-duty multiple strain connectors are offered by Delta-Star Electric Co. for use where multiple cables are being substituted for copper tubing or rolled sections. Fittings are available for multiples of two or four cables in all cable sizes up to 1,000,000 cm.

Liquid-Level Transmitter (412)

General Electric Co. has developed a vertical-type liquid-level transmitter for measuring the fuel level in heavy bomber tanks. This transmitter is 72 in. long (can be furnished in longer or shorter lengths) but weighs only 7 lb.

It is operated by a laminated-cork float traveling on a square shaft inside the vertical tube. As the liquid level changes, the float is rotated by a spiral guide cut in the vertical tube, and turns the square shaft. Position of the shaft is indicated remotely by the d-c selsyn system at the indicator on the instrument panel. Magnetic coupling between the transmitter outside the tank and the float mechanism inside provides a positive gasoline seal, the manufacturer states.

Thyratron Tube (413)

General Electric has announced a new lightweight thyratron tube with both a control and a shield grid for control applications. The new tube is a little over 2½ in. long, weighs about 2 oz., is inert-gas filled and of all-metal construction.

The control characteristic is said to be practically independent of ambient temperature over a wide range, and to have high sensitivity characteristics. The grid-anode capacitance is low enough that the tube is relatively unaffected by line-voltage surges, according to the manufacturer. It has a maximum peak inverse anode voltage rating of 1,300 volts, instantaneous current rating of 500 milliamperes and an average current rating of 100 milliamperes. The cathode is quick heating and is rated at 6.3 volts, 0.6 amp.

Insulation Tester (414)

An all U. S.-made "Megger" insulation tester has been announced by James G. Biddle Co. This unit is of the hand-cranked generator and direct-reading ohmmeter type

and is housed in a molded plastic case. Both variable-pressure and constant-pressure types are being built.

Electric Drill (415)

A ¼-in. portable electric drill with plastic housing (which it claims provides greater shock protection and more power per pound) has been constructed by Independent Pneumatic Tool Co. The plastic "armor" does not support any of the operating parts, according to the manufacturer, but serves merely as a protective shell. Bearings, gears, stator, centerplate and other internal power unit parts are supported within an inner metal skeleton frame. Field case, gear case and grip handle are made of plastic and slide into position over the metal frame.

Bakelite Plug (416)

Eagle Electric Mfg. Co. has developed a bakelite plug of the screwless type which it claims can be assembled without use of a screw driver or any tools. Available for consumer use and in bulk unassembled for manufacturing purposes.

HOW WAR PLANTS ARE SAVING COPPER AND TIME

And Getting BETTER Electric Power Systems

EXPANDING war plants today must get power systems quickly—and yet *save* copper and other materials. Application of the methods outlined here will accomplish both these results—and *also* provide a better-than-ever system. Here's how it is done—

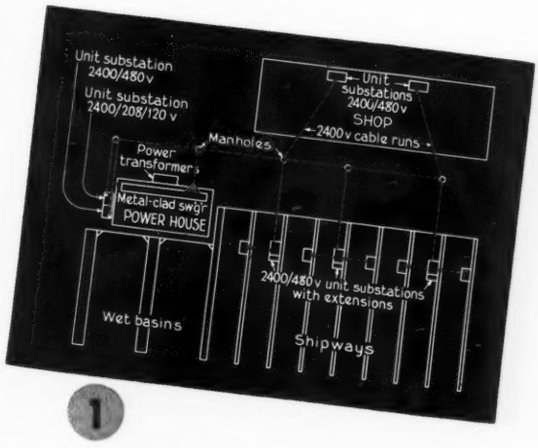
By Using Load-center Distribution

You can avoid long runs of heavy-copper secondaries by running the highest practical voltage direct to relatively small-size unit substations at the *centers* of the load areas, and save tons of cable copper.

Installing substations at the *centers* rather than at the sides of square load areas requires 30 to 40 per cent less copper.

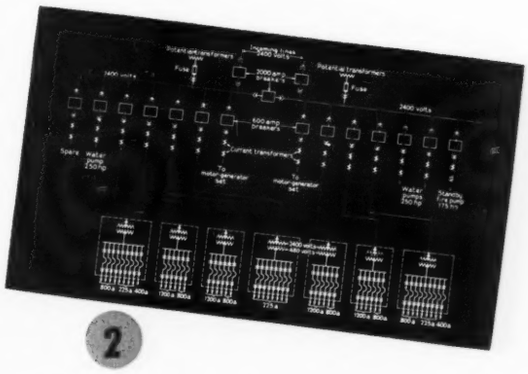
By using four small substations rather than one large substation to serve a square load area, you need only half as much cable copper.

This is both practical and economical with modern safety-enclosed load-center units. These units, consisting of *Pyranol* transformers and *metal-enclosed* switchgear, can be safely installed right in working areas. Bulky, expensive vaults are unnecessary.



1

High-voltage is run directly to unit substations at *load centers*.



2

A simple one-line diagram is all that is needed for selection and ordering *standard* load-center unit substations and switchgear. This can be done when the plant or extension is in the first stage of construction.

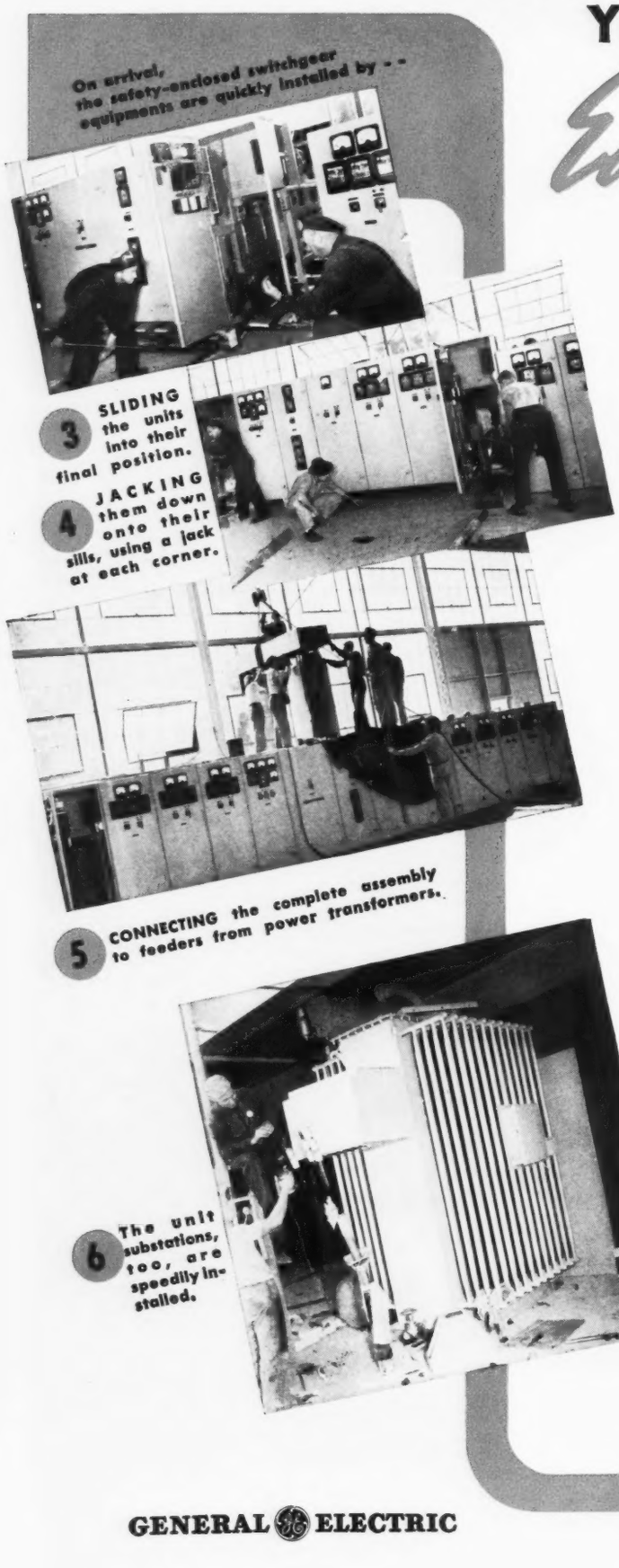
. . . And by Ordering STANDARD SAFETY-ENCLOSED Equipment EARLY

Standard means quick, easy selection and ordering. Safety-enclosed means an exceedingly high degree of flexibility as to location. Together, these advantages enable engineers to provide power in time to meet today's stepped-up schedules.

Do This And . . .

GENERAL ELECTRIC

. . . THEN YOU CAN INSTALL YOUR POWER SYSTEM *Early and Easily*


On arrival, the safety-enclosed switchgear equipments are quickly installed by - -
3 SLIDING the units into their final position.
4 JACKING them down onto their sills, using a jack at each corner.
5 CONNECTING the complete assembly to feeders from power transformers.
6 The unit substations, too, are speedily installed.
INDOORS OR OUTDOORS

Safety-enclosed switchgear and load-center unit substations are completely factory-assembled, and are shipped in compact, easy-to-handle units that arrive all ready to be set in place and connected.

THE SAFETY-ENCLOSED SWITCHGEAR CAN BE QUICKLY INSTALLED simply by a "slide, jack, and connect" operation, as shown at the left. Each equipment is a safe, co-ordinated, unit assembly including circuit breakers, buses, and all associated equipment.

Because these compact units dependably perform any desired combination of functions, they save you the extra time and materials needed to select and install open-type exposed switchgear which necessitates long, wasteful copper interconnections.

YOU CAN PUT IN THE UNIT SUBS JUST AS QUICKLY—INDOORS OR OUT. On arrival, the transformer and switchgear sections of the unit substation are moved into position and bolted together. Connections are made to the incoming and outgoing circuits, and the unit substation is ready for service. Flexibility as to location of these safety-enclosed units is such that you can put them right at the load centers. In fact, they can usually be put in relatively valueless space—along column centers, on sub-balconies, and over washrooms.

GENERAL ELECTRIC

EARLY INSTALLATION SPEEDS THE REMAINING CONSTRUCTION WORK——

Compact, standard unit substations—ordered early and installed the flexible, load-center way—have gone into service in scores of new or enlarged war plants weeks before construction was completed. In this way a ready, dependable supply of power is made available for all the power-driven tools and equipment needed to complete the construction. This eliminates the job of improvising a "temporary" power system that often presents a hazard to workers and is subject to power interruptions. It also eliminates a later change-over to the permanent system.

——AND GETS PRODUCTION MACHINES ROLLING AS SOON AS POSSIBLE

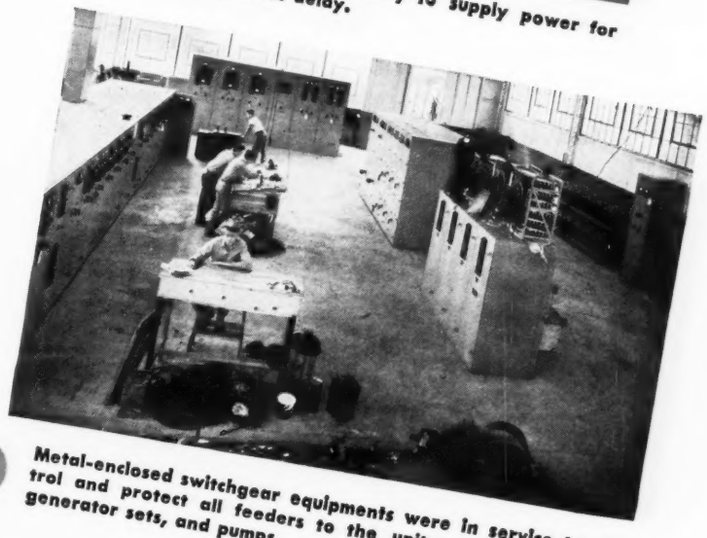
Production machines need not stand idle waiting for an electric power system that couldn't be ordered until the building and the exact load locations "took shape." The flexible load-center system easily follows last-minute rearrangement of the machines, and can safely be ordered in time to arrive when needed.

From the very start, you get full protection for both production and personnel. The primary feeders are controlled and protected by metal-clad switchgear equipments so safe that workers can be located near them. Low-voltage feeders from the load-center unit substations are likewise protected by metal-enclosed drawout-breaker equipments that form an integral part of the unit substation.

In this new war plant—

7 The power system was installed in time for electric cranes to do much of the remaining heavy work during construction, and during installation of machines.

8 Load-center unit substations were ready to supply power for production machines, without delay.

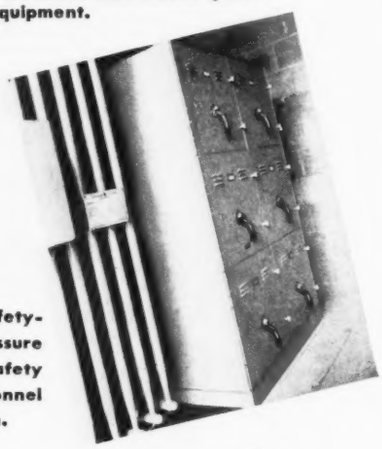


9 Metal-enclosed switchgear equipments were in service to control and protect all feeders to the unit substations, motor-generator sets, and pumps.

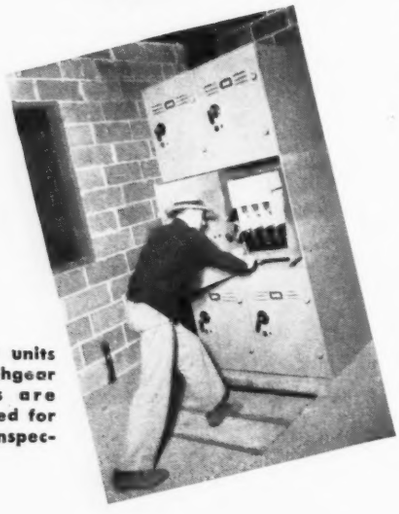
Now—ADD UP THE ADVANTAGES

Packaged load-center unit substations GIVE YOU THESE ALL-IMPORTANT SAVINGS

10 **Many tons of copper are saved by distributing power at primary voltage right to safety-enclosed unit substations at load centers—and the complete, permanent electric power system can be installed in less than one-third the time required to select and install piecemeal equipment.**



11 **All units are safety-enclosed to assure permanent safety to both personnel and production.**



12 **The breaker units of all switchgear equipments are easily removed for quick, easy inspection.**

COPPER — When you replace heavy-copper secondaries with small-size primary cables, you save copper by the ton. Consider a 1000-kva, 4160/480-volt unit substation: For every foot that it is moved closer to the load center, you use 1.23 pounds of copper instead of 13.89 pounds. With many units and hundreds of feet, the copper savings soar.

You save copper within the units themselves, too. A typical unit of metal-clad switchgear uses only one-third the copper required by an open-type, piecemeal assembly for the same job.

TIME — In addition to the weeks you save by ordering safety-enclosed load-center units early, you save time by getting standards instead of specials—in a package instead of piecemeal. You avoid the preparation of detailed specifications, and long, drawn-out correspondence, when you select standard, co-ordinated units. You also save time installing the compact, easy-to-handle units.

THEY ARE IDEAL FOR TODAY - - AND FOR TOMORROW

SAFETY AND DEPENDABILITY — Metal-enclosure of all live parts gives increased protection to both personnel and continuous high production in today's busy factory areas.

EASY INSPECTION — Load-center unit substations include drawout-air-breaker equipments that control and protect the individual low-voltage feeder circuits, and quickly restore service with a turn of a handle. The individual breakers can be easily withdrawn for inspection. Similar breaker units are completely interchangeable, so any breaker can be replaced with a spare in a few minutes.

The higher-voltage, metal-clad switchgear equipments (photos 3, 4, and 5) have vertical-lift breaker units that are similarly easy to remove and to replace with a spare during periodic inspection.

FLEXIBILITY — Safety-enclosed load-center units "go anywhere the load can." Their compactness makes them easy to move, too—whether it be a few feet or miles. This flexibility is valued highly by many engineers who realize that they may want to move power units to follow shifting, changing loads.

GENERAL ELECTRIC

854-22-7800, 5200

Schenectady, New York

BULLETINS

data books, etc.

Wartime Conservation (417)

"Wartime Conservation" is the title of a 96-page booklet published by Westinghouse Electric & Mfg. Co. and containing recommendations for selecting, applying and using electric equipment to achieve the best possible output with maximum saving in critical materials.

The booklet covers up-rating of motors, thermal temperature loading of transformers, industrial network systems, line equipment and materials. It gives tips on saving and salvaging materials in both new and old equipment.

Corrosion Data Sheet (418)

International Nickel Co. has prepared a corrosion data work sheet to assist executives and engineers. This work sheet, according to the manufacturer, is designed to act as a check list to insure consideration and evaluation of all factors influencing a corrosive action and to permit ready comparison of a problem with similar ones as a guide for selecting materials with a satisfactory resistance.

Steel Analysis Chart (419)

American Steel & Wire Co. has published a revised standard steel analysis chart embracing modifications and changes in AISI, SAE and the new NE steels up to Feb. 1. Included is a breakdown showing whether or not various types of products are available in specific analyses, together with the listing of the varying amounts of different component elements used in producing the various grades of steel.

Controls (420)

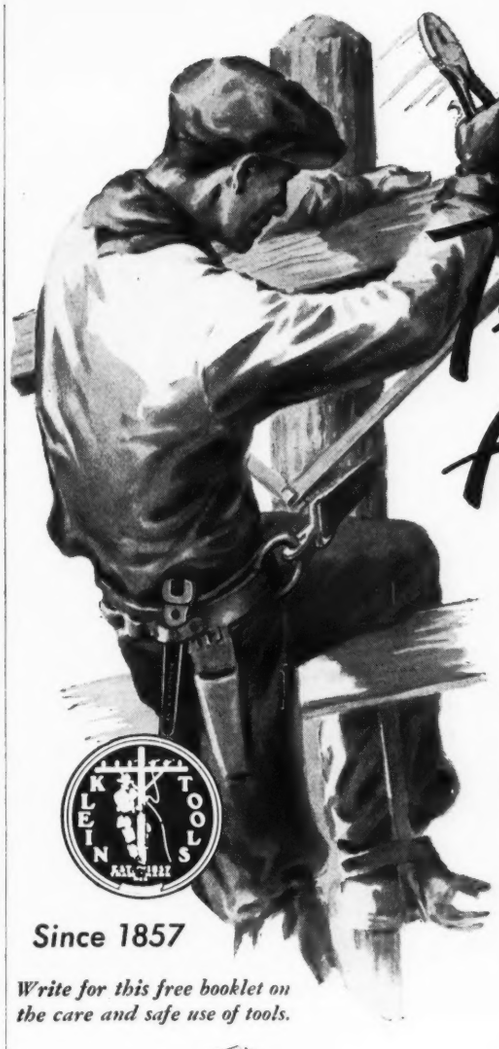
General Electric Co. has prepared a bulletin explaining the primary and additional functions performed by its synchronous-motor controls. Described are starting, accelerating, synchronizing, normal running, pull-out and undervoltage protection as performed by both the magnetic and semi-magnetic types of full and reduced voltage synchronous-motor controls.

Maintenance 421)

Allis-Chalmers is now issuing its "Victory News" under the title, "Victory Production and Maintenance News." This publication is devoted to maintenance suggestions. Exchange of maintenance ideas from equipment operators is invited.

Lamp Series (422)

Save Electric Corp. has prepared a data sheet on its Verd-A-Ray lamp. These lamps are said to cast a pastel green hue on white substances. They are for use in standard incandescent fixtures and include lamps for general lighting; rough service; silver neck lamps; tubular lamps; and high-low voltage.



Trouble Ahead!

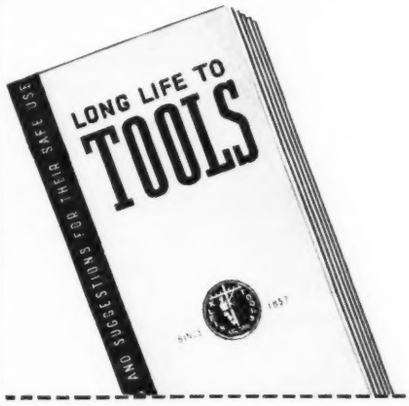
if You Don't Take Care of Tools

You are courting trouble if you misuse tools. The Army and Navy need hand tools—by the ton—to fight a global war. Few will be left for civilian needs at home. Tools misused or lost may be irreplaceable—it pays to take care of the ones you have.

As an aid to promoting longer tool life, we have prepared a handy, pocket size booklet containing helpful hints on the care of tools and suggestions for their proper use. A copy will be sent to any one interested, without charge—mail the coupon below.

Since 1857

Write for this free booklet on the care and safe use of tools.



DISTRIBUTED THROUGH JOBBERS
Foreign Distributors: **International Standard Electric Corp., New York**

Mathias Klein & Sons
3200 Belmont Avenue, Chicago, Illinois
Gentlemen: Please send me without charge a copy of the booklet *"Long Life to Tools."*

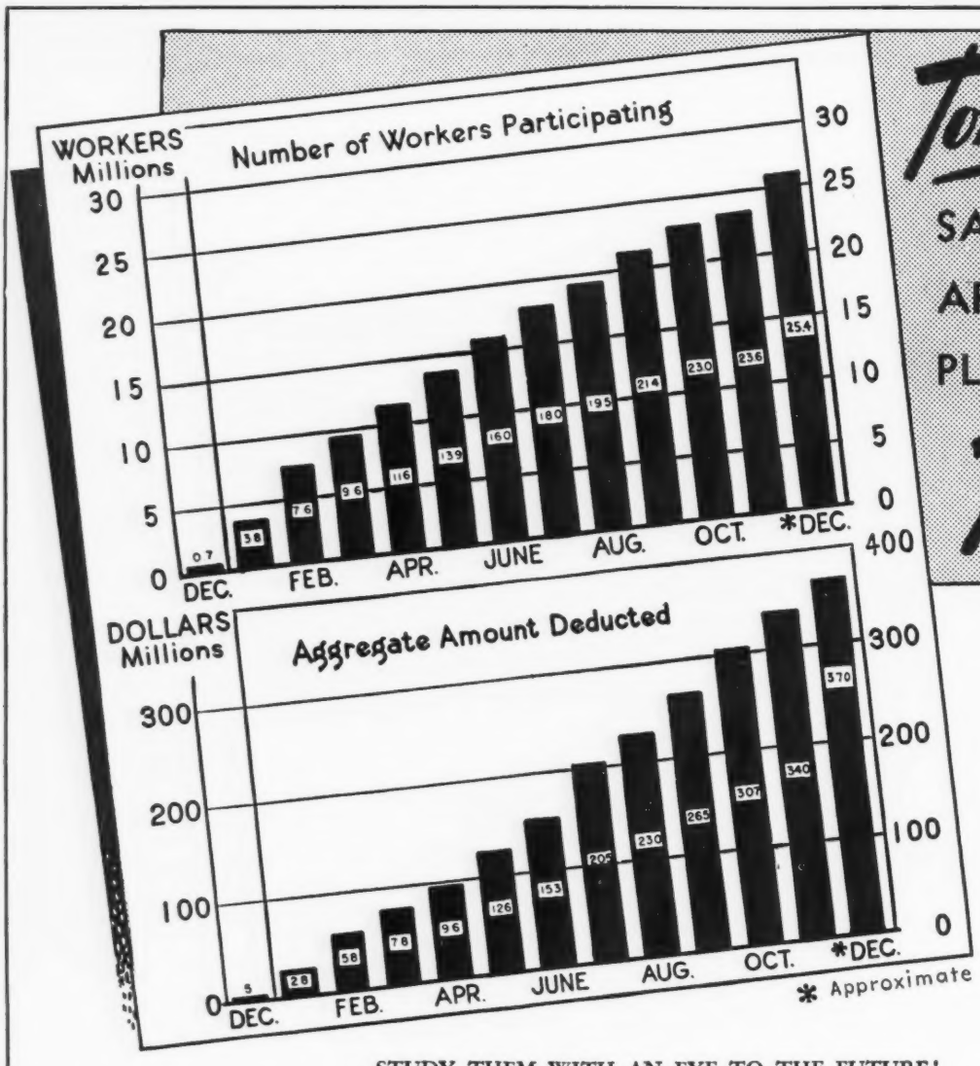
Name.....

Address.....

City.....*State*.....

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill., U.S.A.
3200 BELMONT AVENUE, CHICAGO

MANUFACTURERS OF LINEMEN'S AND ELECTRICIAN'S TOOLS AND EQUIPMENT



Tomorrow's SALES CURVES ARE BEING PLOTTED . . . Today

THESE CHARTS SHOW ESTIMATED PARTICIPATION IN PAYROLL SAVINGS PLANS FOR WAR SAVINGS BONDS (*Members of Armed Forces Included Starting August 1942*)

STUDY THEM WITH AN EYE TO THE FUTURE!

There is more to these charts than meets the eye. Not seen, but clearly projected into the future, is the sales curve of tomorrow. Here is the thrilling story of over 25,000,000 American workers who are today voluntarily saving close to FOUR AND A HALF BILLION DOLLARS per year in War Bonds through the Payroll Savings Plan.

Think what this money will buy in the way of guns and tanks and planes for Victory today—*and mountains of brand new consumer goods tomorrow.* Remember, too, that War Bond money grows in value every year it is saved, until at maturity it returns $4 for every $3 invested!

Here indeed is a solid foundation for the peace-time business that will follow victory. At the same time, it is a real tribute to the voluntary American way of meeting emergencies that has seen us through every crisis in our history.

But there is still more to be done. As our armed forces continue to press the attack in all quarters of the globe, as war costs mount, so must the record of our savings keep pace.

Clearly, on charts like these, tomorrow's Victory —*and tomorrow's sales curves*—are being plotted today by 50,000,000 Americans who now hold WAR BONDS.

Save with

War Savings Bonds

This space is a contribution to America's all-out war effort by

ELECTRICAL WEST

U. S. GOVERNMENT PRINTING OFFICE 505500

TRANSFORMERS NEED EXTRA PROTECTION TODAY!

...and you can get that extra protection from Red Line Transformer Oil

1 Because demands on electrical power have increased all over the Nation, transformers must handle larger loads than ever before. Consequently the oil used to cool and insulate those transformers should be the best that money can buy, an oil that will prevent over-heating and loss of efficiency. Red Line Transformer Oil, a product of Union Oil Company, meets those requirements in every respect.

2 Doesn't form sludge—Red Line Transformer Oil is extremely stable. Exhaustive tests have proved that it remains free of sludge accumulations and other deposits that retard transfer of heat and cut down efficiency. Because of its *low viscosity*, Red Line speeds circulation in circulating-type transformers, quickly dissipates heat produced from waste energy.

3 Absolutely free from moisture, lint, dust—Red Line Transformer Oil has *high dielectric strength*. Extreme care in handling guarantees freedom from foreign particles that reduce insulation qualities. Its *high flash point* minimizes evaporation losses at high temparatures. It is *exceptionally free-flowing* at temperatures far below zero, very important for transformers used in cold climates.

4 Call your Union Oil Resident Manager for a supply of Red Line Transformer Oil today! You'll find that it pays to buy an oil built to do a wartime job.

OIL IS AMMUNITION—USE IT WISELY

UNION OIL COMPANY

TAKE THIS TIP! When you buy petroleum products, buy enough to last. It will protect you against transportation tie-ups and it will insure you of an adequate supply of the products you need.

RED LINE *TRANSFORMER OIL*

ILLINOIS

INDOOR BUS SUPPORT PORCELAINS

HIGH MECHANICAL STRENGTH

HIGH DIELECTRIC STRENGTH

EXACT DIMENSIONS AND UNIFORMITY

ILLINOIS ELECTRIC PORCELAIN CO., MACOMB, ILLINOIS

POWER ON THE MOVE!

Bus Duct always ready for quick layout changes

A southern plant, chin-deep in war orders, needed power circuits for a new department —*in a hurry.* Schedules couldn't wait for delivery of new equipment. What to do?

Bus Duct solved the problem. A 200-foot run of 20 standard 10-foot sections was moved overnight from a less important department. It filled the gap — production went on.

One of the great advantages of Bus Duct is its adaptability to any manufacturing set-up.

Built in standard, interchangeable sections, it can be used and re-used, and represents a *minimum* use of critical materials consistent with sound engineering. Plugs for individual machines can be moved or added at will, or whole sections of duct can be shifted to new production layouts.

Great industries have gained precious weeks—even months—on vital war contracts by installing Bus Duct. They have saved countless man hours through *continuity* of operation. They have cut maintenance costs to the bone.

BUY MORE WAR BONDS • SALVAGE ALL SCRAP METAL

Send for descriptive Bulletin No. 427

BULLDOG
ELECTRIC PRODUCTS CO.
DETROIT, MICHIGAN
BullDog Electric Products of Canada, Ltd.
Toronto, Ontario
Branch Offices in Principal Cities

MANUFACTURERS OF Vacu-Break Safety Switches, SafToFuse Panelboards, Circuit Master Breakers, Switchboards, Bus Duct Systems — FOR LIGHT AND POWER.

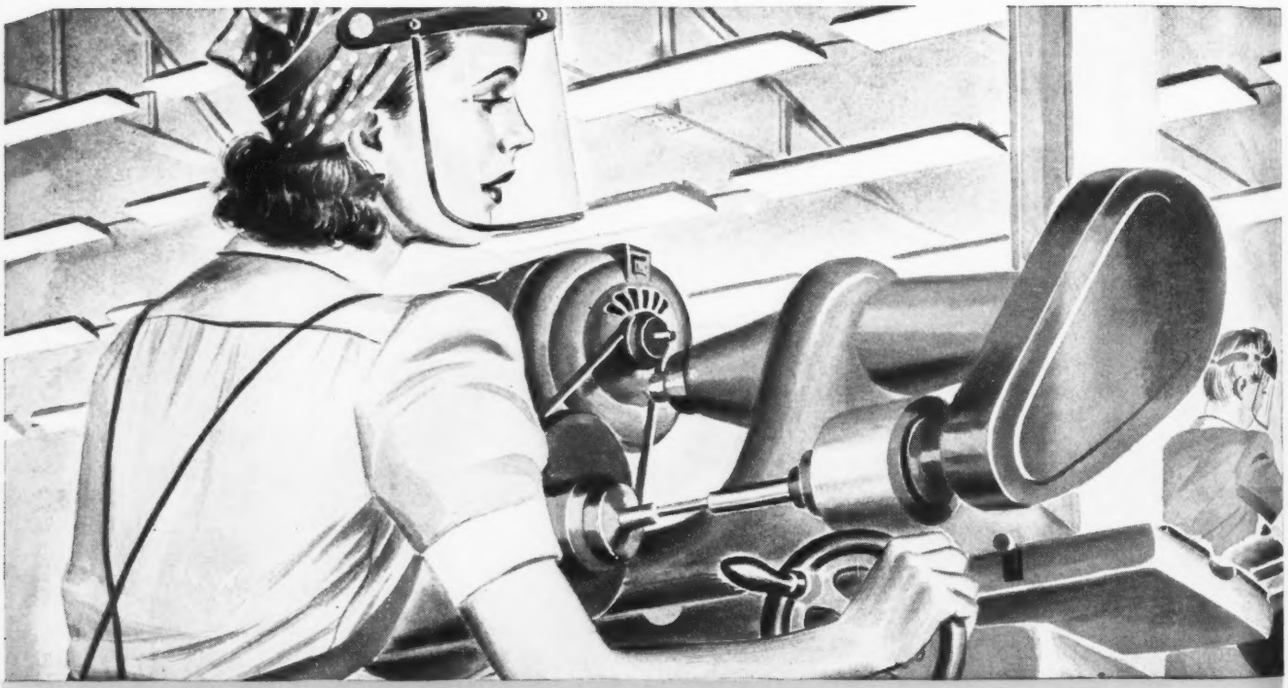
BULLDOG PRODUCTS ARE SOLD AND DISTRIBUTED BY THE FOLLOWING PACIFIC COAST REPRESENTATIVES:

Coast Electric & Manufacturing Co.
1720 N.E. Sixth Avenue
Portland, Oregon
Tel. Garfield 2844

Safety Switchboard & Manufacturing Co.
1445 Stevenson St.
San Francisco, Calif.
Tel. Hemlock 2470

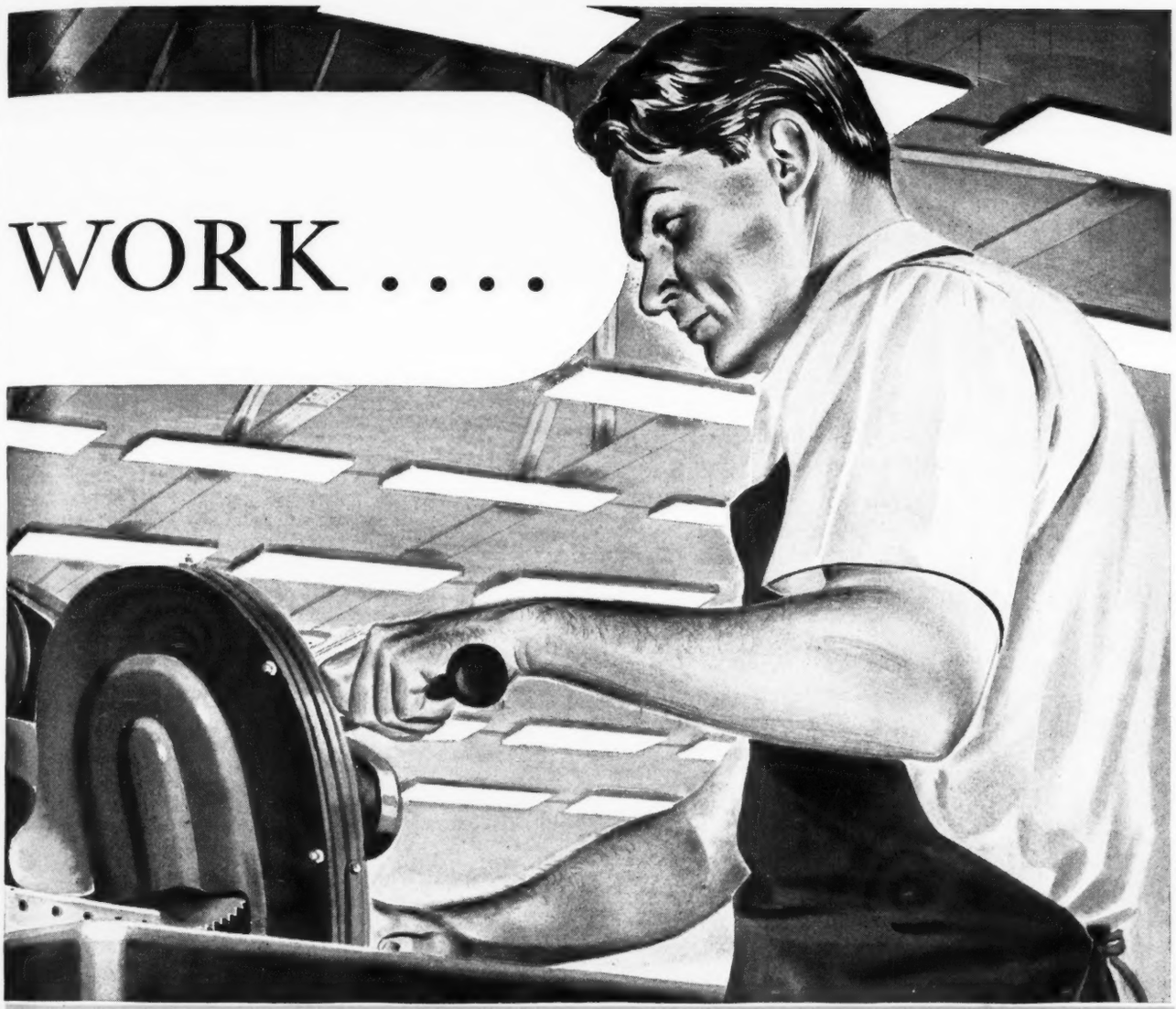
Mullenbach Electrical Manufacturing Co.
2300 East 27th Street
Los Angeles, Calif.
Tel. Jefferson 2224

"SEE-ABILITY" FOR WAR

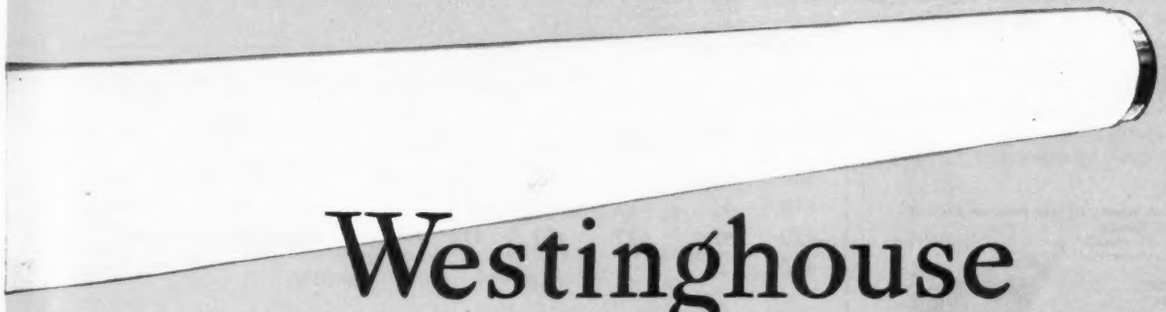


The No. 1 job for the lighting industry in 1943 is to conserve critical materials, copper, tungsten, mercury and other materials needed not only in the manufacture of lamps and in lighting, but in other vital parts of our war effort. Our job is to make the most of the materials we have. First, by helping war industries get the most out of their present lighting equipment. Second, by aiding in the conservation of lamps wherever possible.

"SEE-ABILITY" helps increase war production



With this objective, Westinghouse introduces a new idea in lighting—"See-ability." In these two words are summed up the advantages of good lighting. Today, this idea is directed toward conservation—showing how to get the greatest "See-ability" from present equipment. Tomorrow, this idea will be directed to show the benefit of "See-ability" in stores, factories, homes, offices and highways. Westinghouse Electric & Mfg. Co., Lamp Division, Bloomfield, N. J.



Westinghouse

★ MAZDA LAMPS ★

FOR GREATER "SEE-ABILITY"

Heats in Winter Cools in Summer

For many years, Thermador Fan Type Portable Electrical Heaters have been providing comfort, convenience, and economy for American homes and plants.

Now they are essential in speeding war production by improving working conditions. Clean, compact, and safe, Thermador double-purpose units furnish warm air in winter—circulate cool air in summer. Flameless, fumeless Thermador Heaters are available on priority orders in portable or built-in types for use on 115-volt A.C. service, 1650 watts capacity, or 230-volt A.C. in capacities up to 5000 watts.

Thermador also manufactures built-in Electric Heaters, Electric Ranges, Electric Water Heaters, and Small Transformers.

Write today for Catalog EW4

THERMADOR
ELECTRICAL MFG. COMPANY
5119 South Riverside Drive
Los Angeles, Calif.
Seven Leagues Ahead

Conservation Guide (423)

"How to Conserve with Hotpoint Electric Appliances" is a wartime guide to use and care of appliances for efficient, economical service. The booklet includes 20 pages and seven sections. Section one tells where vitamins and minerals are found and what they do; gives daily meal pattern and suggestions for marketing. A section on electrical refrigeration gives directions for storing foods properly and recipes for ice cream and other refrigerator dishes. In this section are four steps to assure best performance from the refrigerator.

The section on the electric range tells how to conserve vitamins and minerals in cooking; how to save food and money with automatic baking and roasting; how to use left overs; how to broil; how to prepare low-priced meats; proper care of range. With regard to water heaters, the booklet gives economy suggestions and other helpful hints. Preparation of materials for washing, removal of stains and other information is given in the section dealing with the home laundry.

Electric Drill Rigs (424)

Electric drilling rigs are described in a new booklet prepared by Westinghouse Electric & Mfg. Co. The booklet includes 57 pages and tells where to use d-c variable voltage rigs and where to use a-c equipment. Diagrams show layouts of both types of equipment. Typical equipments for various drilling depths are listed for both a-c and d-c drilling and their maintenance and care are discussed. Auxiliary equipment required on drilling rigs also is covered.

Portable Tools (425)

Black & Decker Mfg. Co. has issued a booklet telling how operating men have adapted portable electric tools to war production emergencies. Pictures and reports are printed on 18 cases.

Insulators (426)

A catalogue covering its standard insulators and hardware has been issued by the Porcelain Insulator Corp. Engineering outline drawings of insulators, clamps and hardware items are shown and complete specifications are given.

The booklet includes a bare wire table for types of lines in general use, giving wire sizes, number of wires in strand, diameter in inches, weight in pounds per thousand feet and breaking strength. Hard drawn copper, aluminum conductor-steel reinforced, copperweld and copperweld copper wires are covered.

A list of insulator equivalents covers types from the smallet pin type to the largest switch and bus units.

Battery Charging (427)

General Electric has prepared a new publication describing its automatic charging equipment for motive-power batteries. The eight-page bulletin includes single battery control, multiple circuit battery control and the motor-generator sets. According to the manufacturer, this equipment is intended primarily for batteries used in street trucks, electric industrial trucks, battery-propelled electric locomotives, railway car lighting and air conditioning.

Distribution Duct (428)

Bulldog Electric Products Co. has published a 76-page bulletin on its Bustribution Duct, an enclosed bus bar distribution system. This bulletin is organized in sections dealing with "LO-X" (low reactance) feeder-type bus duct, "Plug-in" type bus duct for branch circuits, and dimensional data and other information. Also included are descriptions and illustrations of basic design methods of estimating, symbols for layout men and estimators, suggested hanger arrangements, technical information, construction details and application data.

Distribution Equipment (429)

Power and distribution transformers and other electrical distribution equipment are covered in a booklet recently issued by Allis-Chalmers. This booklet discusses wartime considerations, such as the use of welded construction and standardization of design to save vital materials and provide interchangeability in installation.

Developments covered in the booklet include the electro-cooler for increasing transformer capacity, unit substations to simplify power control and distribution, feeder voltage regulators, instrument and metering transformers, the oil-seated inert gas system, and load-ratio-control.

Wiring System (430)

Wiremold Co. has issued additional descriptive material on its industrial-system wiring. A small folder contains information on the company's Pancake Overfloor system.

ELECTRICAL WEST, 68 Post St., San Francisco, California

Please send me information about following CIRCLED items:

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430									

Name..... Company*..... Title*.....

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* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

This ACCURATE METERING

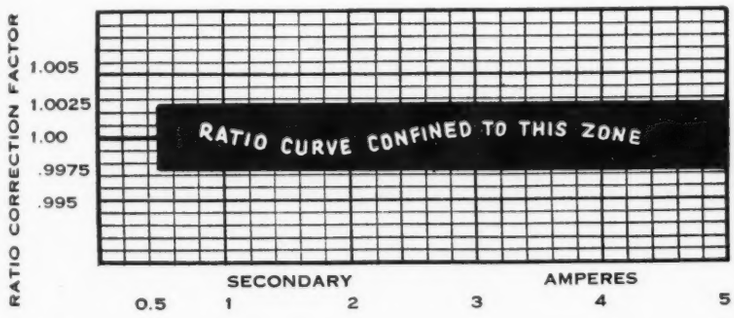
OF *high-voltage* SAVES COPPER, SAVES STEEL, SAVES SPACE...

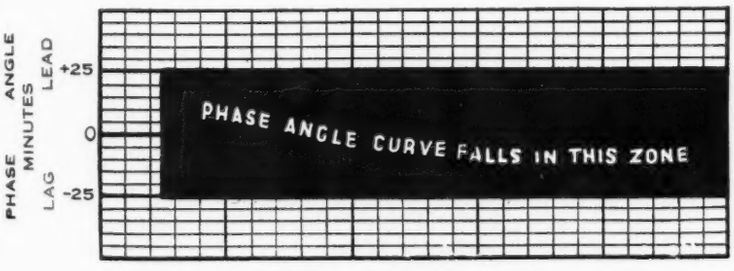
PACIFIC ELECTRIC

Bushing-Type Current Transformers

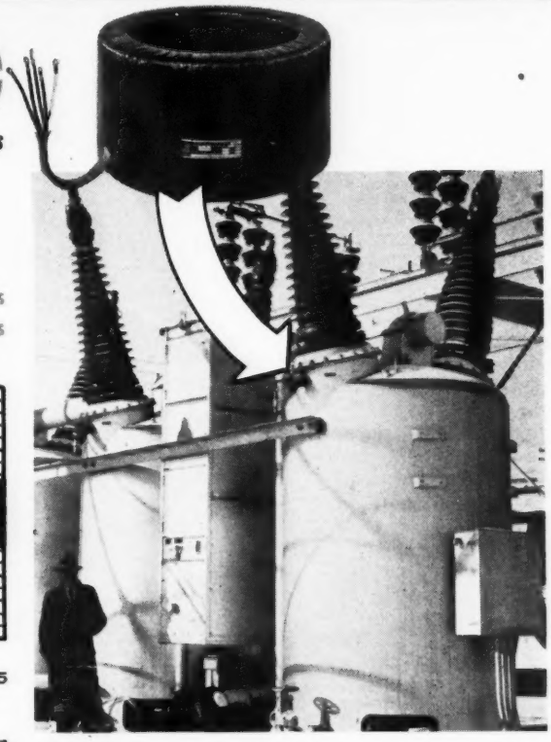
INSTALLED IN P. E. BREAKERS OF 115-kv. AND UP—TYPE CP—

Perfected for years by the Pacific Electric Mfg. Corporation, here's why these Bushing-Type Current Transformers are used by utilities the nation over.





CP Transformer Characteristics fall within limits of spaces above when connected to burden for which transformer compensated. Curves vary in shape depending upon KV and burden. For additional information see our Bulletin No. 57.



With more interconnected loads in vital defense areas, you need the accurate metering of our Bushing-Type Current Transformers. They are installed in P.E. Breakers, old and new, of 115-kv. and above. No separate oil, tank nor bushings needed. You also save copper, save steel, save space, save equipment. You save time and labor at installation.

They're safer, too—these CP Bushing-Type Current Transformers which meter accurately. Write for full details.

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U. N. Halliday, 230 U.S. Nat'l Bank Bldg., Denver, Colo.
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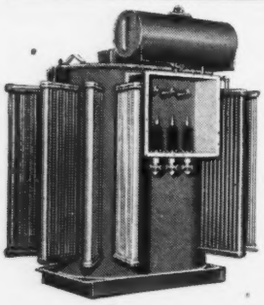
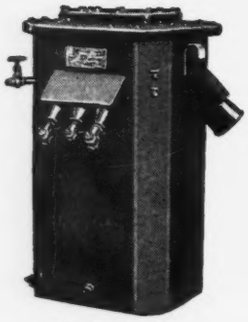
Pacific Electric Mfg. Corporation

5815 THIRD ST., SAN FRANCISCO, CALIF. DUNES HIGHWAY, GARY, INDIANA

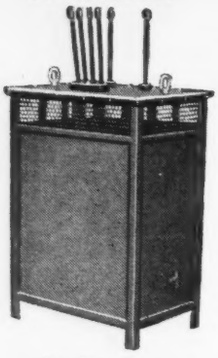
UPTEGRAFF TRANSFORMERS



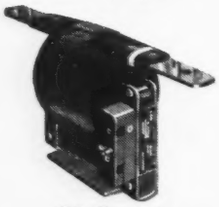
Power



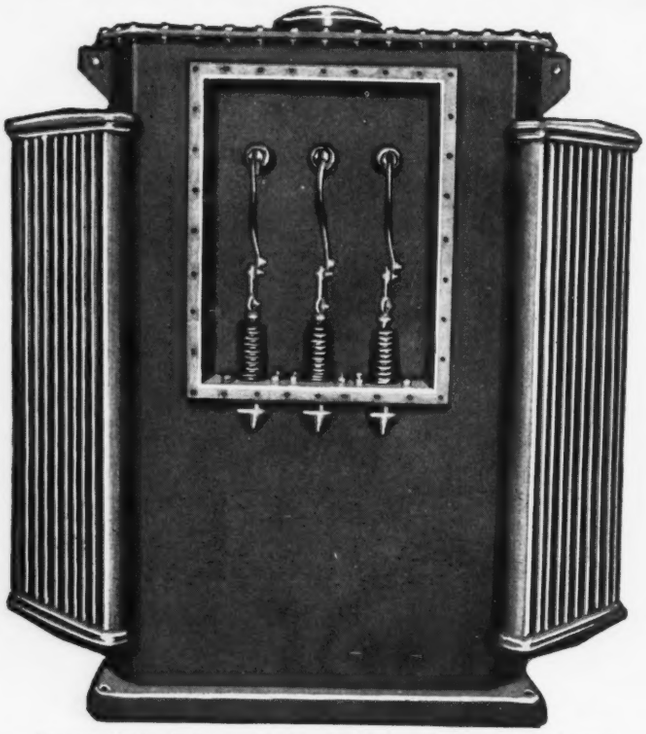
AD Distribution



DA Dry Type



CR Current

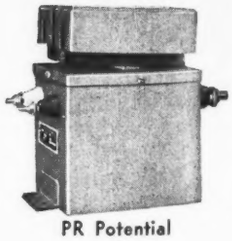


Uptegraff Non-Inflammable Liquid (Askarel) Power Transformer

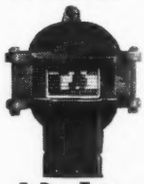
Uptegraff QUALITY SERVICE

UD Distribution

CSP Distribution



PR Potential



E Dry Type

Many Types, Many Capacities

There is a sureness of service in Uptegraff Transformers of every type, that has won them high respect from Utilities, Contractors and Power Users.

Built in a modernly equipped plant devoted entirely to Transformers, and with engineering and production facilities to take care of many special requirements.

All Uptegraff Transformers are built in strict accordance with the standards of NEMA, of AIEE, of EEI, and of ASA.

Tell Us Your Needs

R.E. UPTEGRAFF Manufacturing Co.

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The inside and outside porcelain components of an O-B 115-kv. bushing.

The Finest Bushing Insulation

—and yours forever!

2408-H

You get the best insulation where it's needed most in O-B porcelain-filled bushings. Porcelain possesses ideal dielectric qualities. Porcelain absorbs absolutely no moisture. Porcelain cannot be carbonized by leakage currents. Porcelain is one of the most everlasting substances known--it's best to start with, and stays that way forever...That's why O-B bushings are made of porcelain, inside as well as out. That's why these bushings are setting new standards for long life and complete freedom from trouble. That's why your next bushings should be O-B. It's the only way you can get rugged, porcelain internal dielectric--the finest insulation, and yours forever!

Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

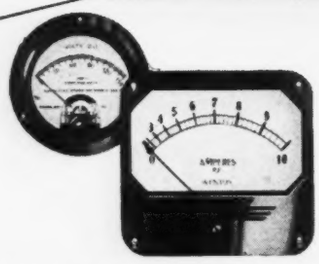
★

KEEP BUYING WAR BONDS

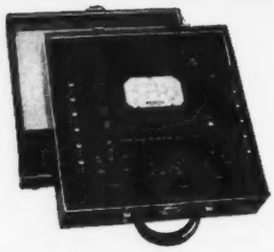
★

FOR ELECTRONICS MEASUREMENTS, TOO,

the Standards are Weston

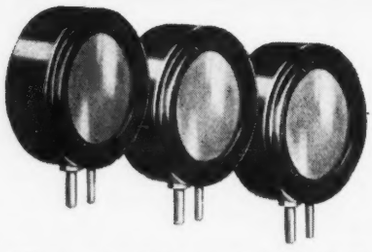


Panel Meters for Electronic applications



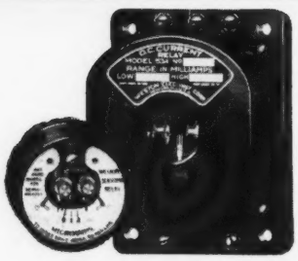
Electronic Circuit Testers

Ultra-Sensitive Laboratory Portables



*Photronic (photo-electric) Cells

Electronic Tube Checkers



Sensitive Relays

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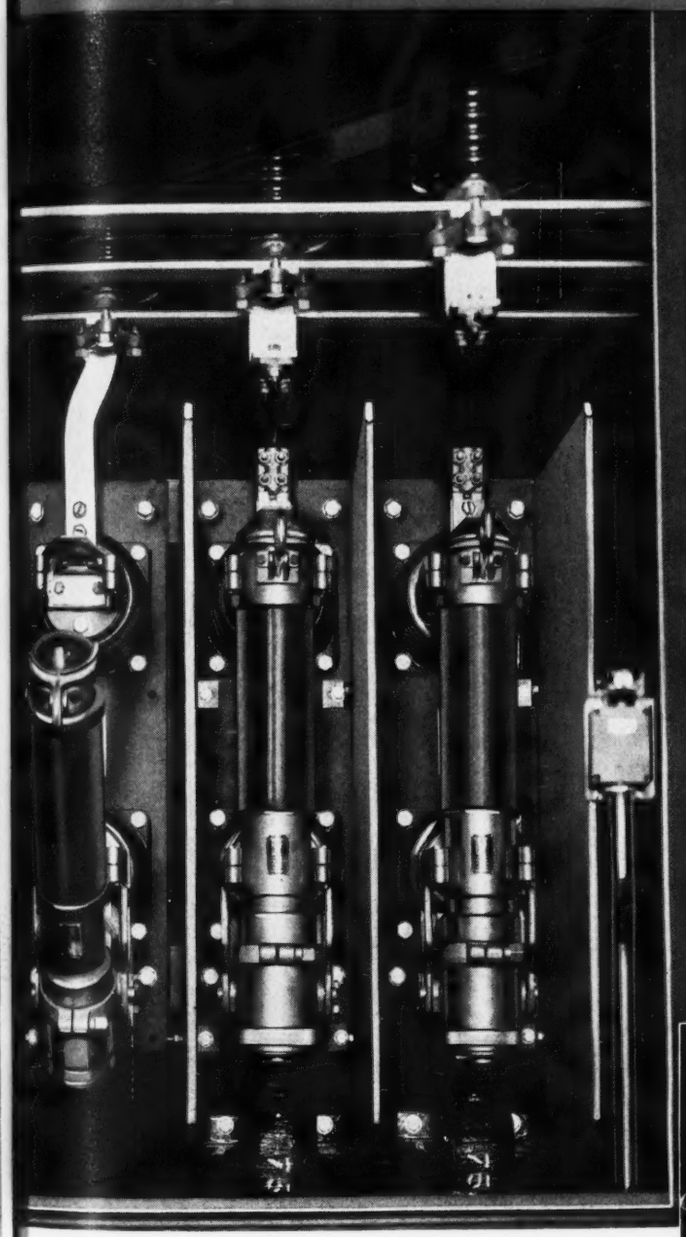
POWER FUSES

Simplify Protection Problems



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- **High short-circuit interrupting capacity (see table below)**
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Circuit Voltage →		2,300/4,000	6,600	13,200	22,000	33,000
Type and Size of Holder	**SMPC-4	17,500	15,000	12,500	10,000	7,500
	SMP-4	27,500	25,000	20,000	15,000	10,000
	**SMPC 5	30,000	25,000	20,000	17,500	15,000
	SMP-5	40,000	35,000	30,000	25,000	20,000

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Refer to your Bulletin 200-E or write for a copy

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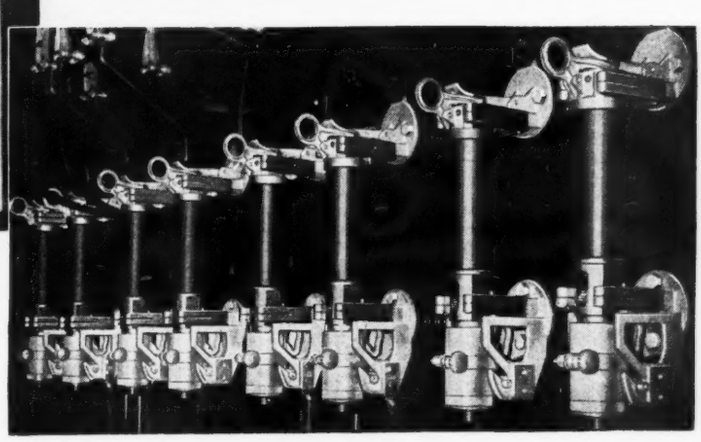

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ELECTRA'S HUSBAND

That Post Victory Garden

First there were all those weeds to plough under. Wonder why it was that thoughts of weeds suggested how like weeds our bureaucrats have sprung up everywhere, and how like weeds we will have to turn them under before we can prepare the seed bed for the planting of a postwar economy that will grow to fruition.

EVENING papers that night headlined F.D.R.'s "from cradle to grave" social security program and the commute train buzzed with comments pro and con, among which ran strong overtones of "this must be the launching of the fourth term drive." On reaching home it was natural to remark to Electra about it.

"Well, this is going to be tough on all the other politicians," I cracked, "there won't be anything left for them to promise now!"

But Electra was way ahead of us, even the President.

"There is still Immortality. The grave is a mighty poor place to leave us, if you ask me."

"Well," I pondered. "I hope the Republicans leave Immortality alone. They'll have a jurisdictional dispute on their hands with the church if they try to muscle into the Beyond."

I had to agree with Electra, though, that it would be rather tough on us all after being taught to lean on a beneficent givernment — I mean government—to be deserted at the grave. The lines of *The Walrus and the Carpenter* came singing through my head.

"After such kindness, that would be
A dismal thing to do."

and I recalled bitterly that, despite such a plea, the oysters were eaten up anyway. It seemed to me just then that despite our pleas, too, we might be eaten up into this all-bountiful postwar scheme that sounds so good but reasons so bad.

After dinner the seed catalogue engaged my attention, for like many another who never had turned a spade (much), we were eager to plant a Victory garden if ever the military secret (sh, rain) would let up so that we could get at it. The point rationing deal had driven us to it, forced us to lay aside memories of previous abortive attempts to grow gardens faster than snails and birds could eat them.

The analogy is very apt. Because of neglect of our garden of enterprise and a long winter of war to prevent our cultivation of the soil to productive growth, the garden has filled with weeds. They grow so thick they almost choke each other out, producing nothing and feeding off the soil which could produce more useful crops. True, they do sometimes have a few tiny flowers among them, and many of them resemble honest plants that are edible or at least grow into real flowers. But certainly from the entire weed patch of them there will be nothing to share and divide to support abundant life for everyone from cradle to the grave.

Before there can be such division of wealth to furnish security throughout life, someone must turn over the ground, weeds and all; someone must rake and sift and enrich the soil, prepare the seed bed, plant and watch the seed until the tiny plants are strong enough to move into sterner fields. Then they must be cultivated, irrigated, protected from damage and guarded against predatory insects, birds and animals who would destroy them while they are delicate and unprepared for such unequal attack.

There is no guarantee of security in Nature. Each living thing must survive of itself. Those of us, like the human race, who must survive by eating of other forms of life after they have attained maturity, must protect and nurture these lower forms of life into maturity or we, too, will perish. Not only is there no guarantee of security but sometimes it seems as if Nature capriciously makes the odds longer by unexpected catastrophes.

The seed catalogue is very pretty. But past experience has taught me that very few gardens turn out that way. Those that do have been given expert care, backbreaking *work*, constant attention—not mere wishes.

Hasn't there been, I wondered, too much wishing to share the produce of that beautiful garden of the hardworking neighbor, without the desire to share in the work of cultivating it for him? Seemed to me that there has been more *envy* than *enterprise* in the philosophy taught all our people these recent years. The idea seems to be to share the finished product, rather than the work. And without work there can be no product.

Pondering all the varieties of postwar plans that seem to have sprung up instead of the flowers that used to bloom in the spring, I was even cynical enough to wonder how many of these plans made by business people and utilities really had their roots in the ground, how many were still seed catalogue dream pictures. Although they are not quite so inclined toward the brotherhood of man, there is more than I like of what the seed catalogues call, "Super Giant Type, Double Orchid—" and not enough plain spinach.

Most of the blueprints of the future after the war (which is far from won yet) seem to be seedbedded in pretty rich fertilizer. I wonder if they will transplant into a world laid waste by war, its natural resources hungrily drawn from the earth to turn into weapons which will be left scattered over the earth.

Thinking like this is not half so happy as that of a seed catalogue picture future. After all, the snails won't get all of the lettuce, and one or two real home-grown carrots will make us forget the backache and, after all, isn't it spring? What if all of the seeds of a heavenly social security do not sprout, and the droughts of adversity do kill off some of the crop of postwar dreams, some of the ideas may grow in healthy ground and produce a worthwhile crop, if we work at the gardening of them instead of just wish them.

In this vein I turned brightly back to Electra with an answer to that Immortality puncture of hers.

"My dear," I startled her by picking up the thought of hours before without leading her back with me into it, "what he is promising must be Immortality, or heaven at least, for it certainly isn't of this world—yet."

It usually takes me that long to think of a snappy comeback.

"What are you talking about?"

"Don't you like this idea of the President's that you will be taken care of, no matter what happens, by the government?"

"See here," she snapped, "I'll do the selecting of whom I am going to be kept by, if you please. I still have my self-respect, I hope."

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Food—The Deciding Issue

Our food problem remains to be solved

THE first thing the Germans did when they occupied Czecho-Slovakia, Poland, Belgium, France—was to empty all warehouses. Everything went into trucks headed for Germany.

The Nazis knew that this war would be won by the army that had the most supplies and the best supply system.

The Nazis knew that supplies are as essential as guns. They knew that the most essential of all supplies is . . . food.

Being the only people on earth who can watch women and children starve, the Nazis seized upon food as their most powerful instrument for disciplining the masses. They added famine to their arsenal of conquest.

The flocks and herds of Europe are being consumed with alarming rapidity. The desperate shortage of meats and fats is growing steadily worse. Our Allies are short of certain foods that we must supply if we expect them to carry on.

And as we supply them, as our imports are curtailed, as our fighting men consume more than they do in civil life, and as we fail to increase our production rapidly enough . . . we, too, become short of certain foods.

Former President Herbert Hoover, speaking before a conference of the Governors and Representatives of twelve Mid-Western farming states in Des Moines on March 15th, sounded the warning that American agriculture, beset by Washington bungling on manpower, farm machinery and price systems, strangling production and distribution, is facing a deterioration which may bring on a national food shortage such as led to the collapse of Russia, the defeat of Germany in the first World War and the fall of France in the present war. Unless this deterioration is stopped, warns Mr. Hoover, we cannot hope to win the present conflict.

Complications of similar magnitude face the food processor and the distributor.

Never in the history of the world has man's dependence on food been so crucial. Yet it is not easy for us to grasp the full significance of the crisis. We are so accustomed to finding milk, eggs and butter on our doorsteps every morning, we are so used to filling our pantries from the shelves of our grocers and markets that we accept food as something that is due us on demand. We do not stop to think that we never are more than a few meals ahead of famine.

But this picture has changed. Now we are faced with food rationing, and every day the shelves of our food markets become more bare.

* * *

Let it be noted that the appointment of a Food Administrator did not solve the food problem. It is still with us; daily it becomes more critical. Unless it is solved, and solved quickly, the very food that Food Administrator Wickard said would "win the war and write the peace" may lose the war and lose the peace.

Put very simply and clearly, the food problem amounts to this: we are trying to feed upward of 200 million people. We are trying to do it with the farms and other facilities that heretofore have been capable of feeding about 145 million people (our present population plus a 5% surplus).

Had the Government foreseen the need and planned ahead, we could have begun by 1941 the enlargement of our farm production and food processing capacity. Two irreplaceable years have been lost!

The gravity of the situation becomes apparent when we consider that 50,000 factories are required to process our foods. Food processing not only is America's biggest industry—it is one of America's most important for, without processing, most foods would perish before they could reach the consumer. The term "processing" covers the salting, drying, smoking, pickling, chilling, canning, packing and other methods of preservation that make it possible for us to eat in 1943 food that was produced in 1942. Few realize that most of the food we shall eat in 1943 was produced and processed last year, that most of the seed we plant this spring will grow food for 1944 or perhaps later.

In one important process of preservation, tin and rubber are vital materials. When the Japs captured Malaya and the Netherlands East Indies more than half of the world's tin and nearly all of its rubber fell into their hands. This forced drastic changes upon our entire food economy. The importance of tinplated steel containers, tops for glass jars and rubber gaskets is fairly obvious . . . metal food containers alone consume, every year, more than 2,700,000 tons of steel.

The aggression of Japan has snared our whole food industry in a maze of intricate packing problems. It has enforced recognition of a new principle of food technology, i.e., that the *method* of food preservation is determined by the *type* of container available. The tin, steel and rubber stringency compels many food processors to adopt

unfamiliar methods – methods that call for a great deal of new equipment. This, in turn, involves the use of critical materials that are so urgently needed for other war purposes.

This conversion of the food processing industry to meet these exacting restrictions has been greatly complicated by two factors that have increased its wartime burden. Indeed, it is these that provide the principal reason for civilian food rationing.

The first of these is the task of feeding our armed forces overseas. Allied ships are being sunk at an alarming rate and the loss of cargo is considerable.

The second factor gravely augments the first. Under Lend-Lease our country is undertaking to feed our Allies to the extent of approximately 60 million people.

Types of food required for Lend-Lease and the armed forces are the finest we can produce. They are the high protein foods, especially meats, cheese and milk; and the protective foods which rate high in vitamin content. Peculiarly enough, the more valuable a food is from a nutritive angle, the more specialized is the processing required to preserve it.

The food processing industry, handicapped as it is, is meeting today's challenge with resourcefulness and enthusiasm . . . despite container complications and shipping shortages.

This is the tenth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

It is accomplishing its Herculean task by resurrecting and modernizing a method of food preservation that is as old as mankind. Probably you have read a great deal about dehydration. You actually may have eaten dehydrated food, but right now nearly every bit of dehydrated food is earmarked for the armed forces or for Lend-Lease.

Food processing never will be as spectacular as the production of bombers or tanks. But under today's conditions, the performance of the food processor is no less important . . . no less inspiring. When we consider that dehydrated food is compressed into solid blocks with a density nearly equal to that of coal, so that almost a whole meal can be carried in a vest pocket, and that half of the shipping space is thereby saved in transportation, we begin to appreciate what the processors have contributed to meet the food problem imposed by the war.

But they have not only contributed new methods, they are achieving new highs in production. And now they are asked to do what borders on the impossible. Consider dehydrated egg powder. Normal production in pre-war years was about 3,000,000 lbs. In 1940 this was increased two and one-half times, in 1942 it was stepped up again, this time forty-fold. And in 1943 the call is for another 60 per cent boost, to make a total of 480,000,000 lbs. Dried milk powder production of 350,000,000 lbs. in 1940 must be increased to 685,000,000 lbs. in 1943.

Vegetables, which were a small item to the processor before the war, now are dehydrated in enormous quantities. The vegetable dehydration industry has had to grow by leaps and bounds without benefit of the high priorities accorded to arms, ship and aircraft building. Production of dehydrated vegetables in 1942 was four times that of 1941, and 1943 calls for a sixteen-fold increase over 1942.

Total dehydrated food production in 1943 is scheduled at 1,750,000,000 lbs., dry basis . . . *all for export.* Multiply that by 10 and you have a rough approximation of the astronomical amount of raw materials that will have to be produced.

Many problems remain to be solved in the troublesome days that lie ahead. But with all his resourcefulness, man has little control over the weather. A severe drought could wipe out all of man's carefully laid plans. If we are tempted to reassure ourselves with the thought that the food situation probably is not so serious as it is painted, it will be well to remember that last year's crop increase over 1941 was due to better than average growing weather.

The war-bred food crisis that now confronts us will be met only by immediate measures to insure a food production ample to allow for adverse weather conditions. The processing industries have demonstrated their capacity to cope with the tasks that are imposed upon them. But the food problem as a whole involves all three functions of production, processing and distribution. And if we are to master the problems that now beset us, all three of them must be coordinated under a single administrative control. "Food will win the war and write the peace". But if American food is to do that double job, we must develop a capacity for food *administration* comparable with the genius of our food industries.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

Look to your Neighbor THE G-E WIRING MATERIALS DISTRIBUTOR

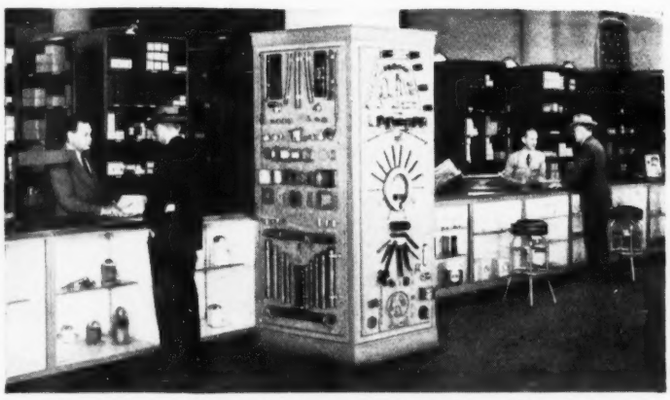
For Maintenance Wiring Supplies

C. W. Floberg (right), Consolidated Copperstate Lines of Phoenix, Ariz., while discussing wiring materials at the Phoenix General Electric Supply Corporation, joined members of the GESCO personnel for this photograph. Left to right in photograph: J. J. Bartlett, counterman, A. L. Rudd, shipping and receiving clerk, J. A. Airey, branch service manager, R. Stuart Rosemond, branch manager, Mrs. Agnes B. Anderson, stenographer, and Mr. Floberg.

You can obtain the wiring materials needed for the maintenance jobs you are handling from the friendly G-E Wiring Materials Distributor right in your own neighborhood. Wiring Materials for conversion wiring and new war project wiring are available, too, of course.

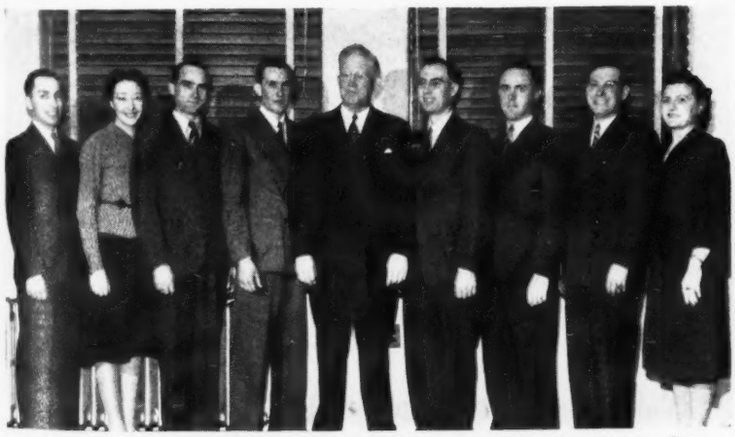
Your G-E Wiring Materials Distributor will be pleased to give you every possible service . . . information on wartime wiring requirements . . . help in selecting materials . . . assistance in planning special wiring. Ask a representative to call. You'll find his experience and knowledge of new wiring methods helpful.

The G-E materials handled by your G-E Wiring Materials Distributor include everything you need for maintenance wiring or new wiring—conduit, boxes and fittings, wire and cable and wiring devices. These materials are easy to use. Their quality is high. Your customers will be pleased with the dependable service they give.



The city sales counter at the Los Angeles, Calif., General Electric Supply Corporation house is designed to give customers the best possible service. In the photograph left to right are: H. L. Kennedy, GESCO sales dept. and R. A. Backus, GESCO salesman, contacting aircraft and war industries, are checking materials for customers; and A. D. Ross, GESCO counter salesman, is serving R. C. Barnett, Los Angeles electrical contractor.

J. B. Johnson (left), industrial city salesman, General Electric Supply Corporation, Rockford, Ill., and L. L. Lillie, internal salesman, handling priorities and stock control, are here placing wiring materials in car for special rush delivery to customer's war job.



The men and women at Hendrie & Bolthoff Mfg. and Supply Co., Pueblo, Colo., G-E distributor, paused for this photograph before a usual busy day devoted to serving customers' war work requirements. Left to right: Leland Latimer, salesman; Edna Davis, Charles Haling, mechanic; Kenneth Renoux, receiving dept.; C. W. Jackson, store manager; Albert Walker, counterman; Harold Weaber, salesman; Clarence Towns, salesman; and Olive Paige.

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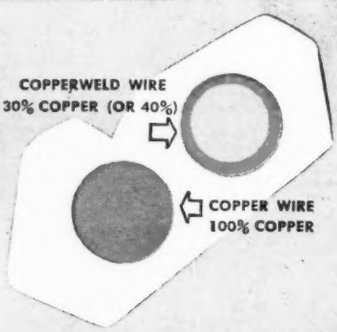


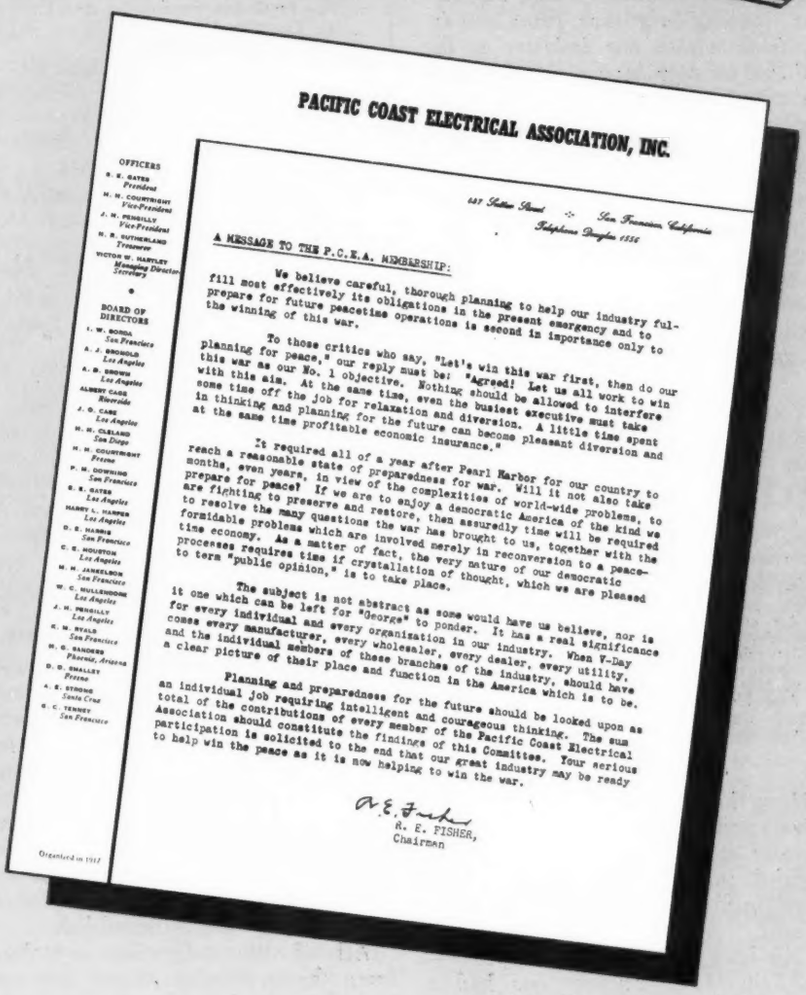
Pacific Coast Representative: **C. E. INGALLS, RIALTO BLDG., SAN FRANCISCO, CALIF.**

ELECTRICAL WEST

APRIL, 1943
VOL. 90 NO. 4

PCEA Launches Postwar Program

Planning Committee enlists utilities in movement



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Telephone Douglas 1556

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Organized in 1917

A MESSAGE TO THE P.C.E.A. MEMBERSHIP:

We believe careful, thorough planning to help our industry fulfill most effectively its obligations in the present emergency and to prepare for future peacetime operations is second in importance only to the winning of this war.

To those critics who say, "Let's win this war first, then do our planning for peace," our reply must be: "Agreed! Let us all work to win this war as our No. 1 objective. Nothing should be allowed to interfere with this aim. At the same time, even the busiest executive must take some time off the job for relaxation and diversion. A little time spent in thinking and planning for the future can become pleasant diversion and at the same time profitable economic insurance."

It required all of a year after Pearl Harbor for our country to reach a reasonable state of preparedness for war. Will it not also take months, even years, in view of the complexities of world-wide problems, to prepare for peace? If we are to enjoy a democratic America of the kind we are fighting to preserve and restore, then assuredly time will be required to resolve the many questions the war has brought to us, together with the formidable problems which are involved merely in reconversion to a peacetime economy. As a matter of fact, the very nature of our democratic processes requires time if crystallization of thought, which we are pleased to term "public opinion," is to take place.

The subject is not abstract as some would have us believe, nor is it one which can be left for "George" to ponder. It has a real significance for every individual and every organization in our industry. When V-Day comes every manufacturer, every wholesaler, every dealer, every utility, and the individual members of these branches of the industry, should have a clear picture of their place and function in the America which is to be.

Planning and preparedness for the future should be looked upon as an individual job requiring intelligent and courageous thinking. The sum total of the contributions of every member of the Pacific Coast Electrical Association should constitute the findings of this Committee. Your serious participation is solicited to the end that our great industry may be ready to help win the peace as it is now helping to win the war.

H. E. FISHER,
Chairman

LAST summer, about six months after Pearl Harbor, President S. E. Gates, of the Pacific Coast Electrical Assn., created a planning committee for that organization. Following are excerpts from his letter of appointment.

1. "In a discussion of this subject with the board of directors at its recent meeting, the idea developed that there is a definite need for a committee whose responsibility will be the study and analysis of immediate and postwar problems. The committee will act as an advisory committee to study the problems which the present emergency has developed, and will seek solutions and make recommendations for carrying out those things which can be done to an advantage in solving the problems."

2. "Such research is necessarily of a long range planning type and should be of a continuous nature, and I anticipate that for this reason the present committee will be asked to serve not only during the current administration, but in future administrations at least for the duration."

3. "In my opinion, one of the best methods of getting definite and tangible results is the encouragement which the committee can give to individual companies to set up within their own organization groups of one or more who will similarly study the problem."

These comments make clear the extent and magnitude of the project and emphasize the need for full and continuous cooperation by all segments and individuals in the electrical industry.

Plans and work must go forward now to try to establish the kind of world for which we are fighting. Free enterprise and democracy are so interdependent that the preservation of both should be one of our fundamental aims in any plans developed. The President of the United States, in a letter to the Congress on this same subject, stated most succinctly the position every American should take. He said:

"Plans and programs to win the war and to win the peace must grow out of our common national purpose and with democratic participation in planning by all of us. Through efforts to state our objectives and public discussion of their merits, we play our parts as free citizens."

Objectives

It is not simple to state in a few words the objectives for which we are planning and working. It is taken for granted, of course, that the first and most important goal for which we are all striving is victory. Even victory, however, will prove but a passing satisfaction if it does not secure our American way of life.

Assuredly, the responsibility of this committee and its co-workers is not to deal with all of the complexities of our modern society, but rather to limit its attention to those problems which

pertain to commercial and industrial matters of interest to the electrical industry. Specifically, it is purposed *to promote and stimulate study, research and planning by groups, firms, and individuals within our industry to the end that we may have a part in bringing about stability, economic strength and prosperity under the American enterprise system when peace is restored.*

To realize this goal, planning by all elements of our industry will be necessary. This planning must embrace all important subdivisions of our businesses such as engineering, production, finance, marketing and distribution. product development, purchasing and personnel.

Functions

Your committee believes its function is to act as a catalyzer and stimulator of group and individual company planning. It will:

1. Suggest subjects and problems in need of solution.
2. Present plans of procedure and outlines of organization to facilitate planning.
3. Transmit pertinent information and reference material published from time to time.
4. Act as liaison with other national and sectional planning groups, private and governmental.
5. Through the regular machinery of PCEA, carry on investigations, study, and research of the type not possible in the separate companies.
6. Assemble, digest, and prepare for use such facts, findings, and conclusions received from various subdivisions of the industry.

Need for Planning

More than just a token response by private industry is necessary if, when the war ends, business is to have its rightful place at the council table when our future economy is blueprinted. At the present time—and dating back prior to Pearl Harbor—the Federal government has had a program of planning underway. Many tomes of ideas on the subject by these government representatives already have been printed. Private business has most at stake and should prepare now, through sound planning and progressive thinking, to make itself heard.

Certain national organizations, privately financed, are already at work. Some of these, such as the National Association of Manufacturers, the United States Chamber of Commerce, the Committee for Economic Development and certain others, deserve our support. We can help them only by contributing something of value from our industry.

It should also be borne in mind that not all the results to be had from this effort will come in the distant future. Some ideas and suggestions will be of such nature that their introduction now will be justified. Some plans will result in economies, some will directly aid the war effort, and some, possibly, will conserve present values for future usefulness. The planning, therefore, should include wartime as well as peacetime problems.

PCEA PLANNING COMMITTEE

R. E. Fisher, Chairman,
Vice-President, Pacific Gas and Electric Co., San Francisco.
R. M. ALVORD,
Vice-President, General Electric Company, San Francisco.
H. H. Courtright,
President, The Valley Electric Supply Co., Fresno.
H. L. Harper,
Pacific District Manager, The Graybar Co., Los Angeles.
R. C. McFadden,
Sales Manager, Southern Calif. Edison Co., Ltd., Los Angeles.
H. A. Lott,
Operating Engineer, Southern Calif. Edison Co., Ltd., Los Angeles.
F. R. George,
Engineer of Electric Operation, Pacific Gas and Electric Co., San Francisco.
George C. Tenney,
President, McGraw-Hill Co. of California, San Francisco.
O. R. Doerr, Secretary,
General Sales Manager, Pacific Gas and Electric Co., San Francisco.

Problems Suggested for Consideration

Almost every company is faced with a number of individual obstacles and difficulties brought on by the emergency. There are in addition some problems common to all branches and firms of our industry. Some of these were recognized and their relative importance evaluated in a questionnaire-survey of last September, when the association membership was circularized for its views on the subject.

All of the suggestions obtained from the September survey are embodied in the following list, although they may be set forth in this text in somewhat different words and sequence. The suggestions, with elaboration for convenient use, follow:

1. *Government Policies*
   a. How many of the wartime federal agencies will continue to operate when the war ceases?
   b. How long will it be after V-Day before strictly wartime controls are removed?
   c. How will the government taper off its manufacture of war goods, i. e., ships, planes, tanks, armaments?
   d. How quickly will wartime critical materials be released for civilian use?
   e. What policies will obtain after the war on government-owned power projects, REA, etc.?
   f. In view of wartime credit restrictions, what will be the government's attitude in the postwar period? Will federally sponsored credit again be offered through agencies like EH & FA and FHA?
   g. Will the government attempt some form of controlled economy such as is contemplated in the recently announced Plan for Installment Selling for Postwar Delivery?
2. *Probable Status at End of War*
   a. What is likely to be status at war's end? (Some companies will have completely converted to war work; others will have discontinued entirely. All will have been affected one way or another.)
   b. What about:
      Capital structure
      Plant investment in purely war production facilities
      Depreciation and reserve account?
      Cash position.
   c. To what extent have prewar products, trade names and business been preserved?
   d. How long after V-Day will it require to convert to normal profitable operations?
3. *Preparation for Full Employment*
   a. How quickly after the war is over will the government release men and women from the services to be absorbed by private industry?
   b. What particular problems involving temporary war employment must be solved to insure replacement of returning service people?
   c. Can plans be laid now to insure employment of more personnel than were carried on the pay rolls before the war?
   d. Will schedule of reconversion permit full employment at a rate in conformity with change-over from war economy to a peace economy?
4. *Production* (Includes Generation of Power.)
   a. What plans should be made for conversion to peacetime production and how soon should such plans be completed?
   b. What changes in plant layout, processes and methods should be made at time of reconversion to improve efficiencies?
   c. What disposition should be made of plants or equipment provided for wartime manufacture? How much can be used in normal operations? What should be scrapped?
5. *Product Development*
   a. What present or prewar products or services will meet postwar demands?
   b. Are new products needed? If so, how many, if any, are in process of development or already perfected?
   c. Is full advantage being taken of wartime invention, research and performance of identical or similar products?
6. *Marketing and Distribution*
   a. What is the unit or dollar volume of a particular market?
   b. What portion of a given market should your company serve?
   c. How will the postwar market differ from the present and prewar market?
   d. How stable will be the population influxes of the war period?
   e. Has the character of the market changed by virtue of population changes?
   f. To what extent have changes in distribution been indicated as result of war?
   g. What has competition been doing? What are they doing?
   h. Has full consideration been given to past consumer movements in plans for future distribution?
7. *Customer Purchasing Power*
   a. How will postwar customer purchasing power compare with prewar?
   b. Will enforced wartime restrictions change postwar buying habits?
   c. Will wartime savings and bond purchases greatly influence postwar buying?

d. To what extent will customer's liquidity affect postwar purchases?
e. Will a demand for long-term credit return?
f. To what extent will tax burdens and tax liability affect purchasing power?

8. *Personnel*
a. To what extent has organization been preserved?
b. Can former employees returning from the services be readily absorbed?
c. To what extent can wartime temporary manpower be continued?
d. Are industrial relations strong enough to withstand the trials of transition to peacetime operations?
e. Have you a training plan for employee reconditioning?

9. *Finance and Accounting*
a. How liquid will a particular market be?
b. What new habits of business and buying will have to be met?
c. What credit program will be in order?
d. What will be the money situation—availability, rate, etc.?
e. In shifting population areas will unusual credit hazards exist?
f. Will prewar credit, collection and accounting procedure suffice?

10. *Purchasing*
a. How will new materials developed and/or perfected during the war influence postwar operations?
b. To what extent will new sources of supply be necessary?
c. Will wartime practices in packaging and handling materials affect purchasing procedure?
d. Will transportation burdens incident to postwar reconstruction present new or additional obstacles?
e. To what extent will war salvage material enter the picture?

How to Organize a Planning Program

These comments are offered merely as a guide. Companies and trade associations vary so widely in size, type of business, character of organization, etc., that only general suggestions can be made.

1. *Appointment of Committee:*

First, although the sequence may strike one as being in reverse, it is desirable as Step No. 1, to assign responsibility for the long-range planning job. It has been our experience that this action, taken even in advance of determination of objectives, leads to a more thorough approach to the entire undertaking.

Management in each instance, with or without giving advance thought to specific goals to achieve, can determine by a review of the list of basic problems which and how many of its executives should be detailed.

In small firms one key man may well fill all qualifications. In large concerns, as evidenced by experience to date, the heads of production, sales, personnel, and engineering or operational activities constitute the panel of the majority of the companies.

Whatever may be the company setup, the idea has been to appoint only a small group of key executives representing the major functional branches of the business. In this way provision is made to bring to bear on the diversity of problems the best talents in each organization or firm.

By far the most successful operations to date in this field of future planning are those which have the services of one or more full-time aids or a secretary to keep the program moving in spite of demands placed on the active and important executives who generally serve on these committees. Much follow-up and detail work can go along with only nominal guidance from committee members.

2. *Determination of Objectives:*

Before objectives for the future can be determined, it is necessary to have an idea of the kind of operation or business desired at some predetermined future time. The first move, therefore, is to secure from management its opinions on this important point. It is possible and, with those companies fully converted to war work, highly probable that the present type of operation is not geared to peace.

A very important consideration, furthermore, is that having to do with the duration of the war. Nothing definite can be had from any source on this question, but it is desirable in setting up planning machinery to have in mind some period of war time and also a reasonable time element for readjustment after the war. Of course, planning must be flexible to permit of adjustment for a longer or shorter war period than originally programmed. This is necessary also in order that new conditions and new developments can be taken into account as these changes occur—as assuredly they will.

An effective planning program should contemplate some benefits which need not await termination of the war. It is desirable, therefore, that objectives and the plans of procedure based thereon be classified under the headings of Wartime and Postwar Objectives.

A. *Wartime Objectives*—Under this subtitle list all objectives or aims which, while they may have a decided bearing on future normal business, can also contribute to your present operations. A few items are enumerated under this category by way of suggestion:

1. Simplification of capital structure of business with eye to future.
2. Modification of organization.
3. Establishment of adequate cash position.
4. Research activities.
5. Conservation measures.
6. Customer relations and goodwill-building efforts.

B. *Postwar Objectives*—The items to be listed here are numerous. They would include, among others, the goals or objectives dealing with such things as:

1. Conversion of plant or equipment to civilian production.
2. Product development.
3. Markets and buying power.
4. Methods of distribution.
5. Financing problems.
6. Personnel problems, including employment opportunities, training, etc.
7. Changes in methods, processes, raw materials, etc.

3. *Importance of Scheduling and Follow-Through:*

It is not enough to complete an organization responsible for this planning work and to assemble an array of pertinent and important problems and objectives. Time passes very quickly and, therefore, some schedule of reports of progress or appraisal of work accomplished is desirable. Even though the planning is necessarily of a long-range type, some "dead lines" are essential to keep the studies moving forward.

The objectives which can be put into effect now as an aid to the war effort, as well as for their postwar value, should be explored first and conclusions reached. The other basic problems should receive continual attention also, however. The fact that some tangible progress is noted from time to time will serve as encouragement to "keep plugging away" at the larger, longer research bearing on the postwar economy.

In short, the above suggestion merely utilizes a simple psychological fact, i. e., having decided on action, accomplishment is surest if it quickly follows the decision to act and is programmed on a step-by-step, well-defined basis.

Individual Responsibility

It is clear from the foregoing that the association through its planning committee has provided the machinery by which individuals, companies, and organizational groups of the electrical industry, can become a part of and participate in the "Planning for Peace" projects of private enterprise.

You can become an active unit of the movement by organizing and enlisting in the program.

The rest is up to you. Inasmuch as the committee is intended to act primarily as a clearing house, screening and liaison agency, its effectiveness in, and contributions to, the national planning picture will be in direct proportion to individual interest and effort.

Multiple Purpose River Development

Maximum benefits for power and mining derived from Narrows project where Pacific Gas and Electric Co. cooperates with public agencies—Power plant incorporates many innovations including automatic control

H. V. Lutge and E. F. Maryatt**
Pacific Gas and Electric Co.

THE Narrows development, located on the Yuba River, is another "multiple purpose" project in which Pacific Gas and Electric, following its long established policy of cooperation with public agencies, has joined. Other "multiple" projects in which this utility has participated by constructing the power features and supplying the market are the Melones project of South San Joaquin and Oakdale Irrigation Districts, and the mountain storage project of the Nevada Irrigation District. In these developments irrigation was paramount, with power secondary and flood control and navigation only incidental. With the Narrows development the primary incentive is the control, by storage, of hydraulic mining debris. Power development was important in that the revenue it will supply is of material assistance in reducing the cost to hydraulic miners of storage space in the reservoir. The development is also of some benefit to navigation and to irrigation. The Bullards Bar project, built originally by Yuba Development Co. but now part of the electric generating system of Pacific Gas and Electric Co., is the forerunner of this type of multiple purpose project.

Ever since the famous "Sawyer decision" which in 1884 restrained the North Bloomfield Mining Co., operating on the Middle Fork of Yuba River, from discharging debris into the stream, thus virtually stopping hydraulic mining in California, the owners of hydraulic mining property have been endeavoring to find a way to make use of their properties. In 1893 the California Debris Commission was created by act of Congress and empowered to license hydraulic mining provided the mining tailings were restrained from entering the streams. Partly because of the absence of sites for the storage of debris and the high cost of creating such storage capacity, there has been relatively little activity in hydraulic mining. During the 40 years after the creating of the California Debris Commission, the total yardage mined hydraulically in the basin of the Sacramento and San Joaquin rivers was less than two per cent of the yardage mined in the 30 years prior to the "Sawyer decision" in 1884. It was believed by many that hydraulic mining would be stimulated if storage space which could be purchased by the miner were provided by the government.

In 1934 the California Debris Commission Act was amended to provide for the repayment of the capital cost of any restraining works constructed by the commission by means of a tax on each cubic yard mined. Any money which would be derived from the use of any such restraining works for irrigation or power or other purposes would be credited to the project and the amount of the tax proportionally reduced. In 1935 Congress appropriated $6,945,000 for the construction of four debris storage reservoirs in accordance with plans prepared by the California Debris Commission, as follows:

Reservoir	Location	Capacity for New Mining Debris Storage (Million cu. yds.)	Estimated Construction Cost
Upper Narrows	Yuba River	118	$4,300,000
Dog Bar	Bear River	26	1,130,000
North Fork	North Fork American River	26	825,000
Ruck-A-Chucky	Middle Fork American River	24	690,000
		194	$6,945,000

Construction was not to commence until the repayment of the construction cost, without interest, was assured to the satisfaction of the Secretary of War through guarantees of responsible individuals or corporations that they would mine under license from the California Debris Commission material in amounts aggregating the total capacity of the reservoir for the restraint of debris. The necessary guarantees were made and construction commenced on three of these dams and reservoirs, namely, Upper Narrows, North Fork, and Ruck-A-Chucky. The damsite chosen for the latter was abandoned because of foundation troubles and construction has been suspended; the other two are completed.

Construction of the Narrows dam was begun in December 1938 and completed in December 1940. The dam is a concrete arch structure. The crest is 1,150 ft. long. It is depressed in the central portion for about 500 ft. to form the spillway. The elevation at the top is 546 and at the spill crest 527. The lowest foundation elevation at the spillway section is about 260. Downstream water surface elevation at the dam with 500 c.f.s. flowing is about 288, making the difference in elevation between upstream and downstream water about 240 ft. The dam creates a reservoir of 70,000 acre-ft. capacity with water at elevation 527 and floods 812 acres at this elevation. The reservoir extends upstream about ten miles to within a mile of Colgate power house. Due to the fact that hydraulic mining debris will not deposit on a horizontal plane but must lie on a slope, the estimated capacity for storage of debris in the reservoir includes, in addition to all the water storage space, the volume in a wedge between a horizontal plane at elevation 527 and a plane sloping upstream from elevation 527 at the dam. The total volume for storage of debris on this basis was estimated at 136 million cu. yd. of which 113 million cu. yd. is in the water storage space below elevation 527.

Although the Narrows dam created a head in excess of 240 ft., the original authorization for the construction of Narrows dam and reservoir did not make the development of power a necessary feature. Early reports on the project indicated that the power development was practicable and power values were a substantial amount. Under the California Debris Act as amended in 1934 any revenue to be had from the use of the dam and reservoir for power purposes would be credited to the project and go to reduce the tax on the gravels mined and stored in the space. For this reason, the mining interests, who were ready to commence hydraulic mining operations as soon as the reservoir was completed, promoted the early construction of a power plant to develop the head and water supply available at the Narrows dam.

The Sacramento Valley Utility Co. was formed with A. H. Breed as president and Frank E. Bonner as vice-

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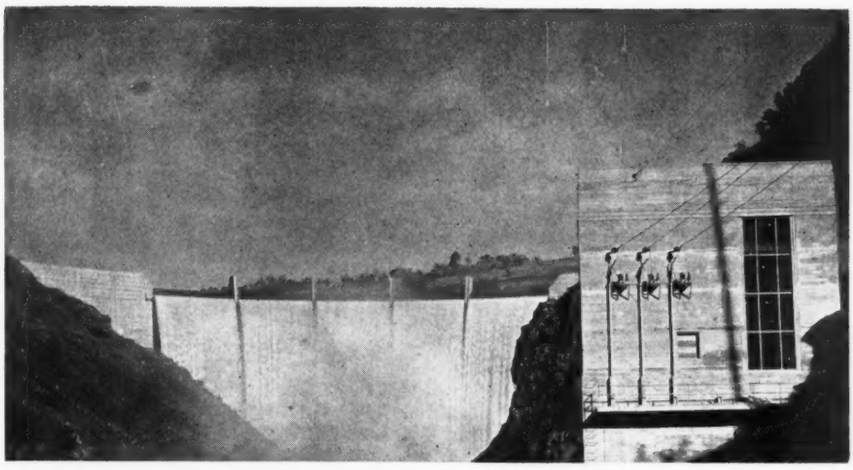
president and chief engineer. Under the direction of Bonner, the necessary permits for the diversion of water were acquired from the State of California, plans for the construction of the plant were prepared, application was made to the Federal Power Commission (which has jurisdiction over power developments involving the use of government dams) for preliminary permit and later for license, and negotiations were conducted with Pacific Gas and Electric Co. for the marketing of the available power and with the California Debris Commission leading to an agreement as to the payments to be made for the use of the reservoir features. The negotiations ended with PG and E agreeing to take over the interests of the Sacramento Valley Utility Co. These included an obligation to construct, operate and maintain a power plant of 11,000-kva. capacity in accordance with a license from the Federal Power Commission and an agreement with the California Debris Commission covering the rental cost of the water storage and outlet facilities.

Of the total space available for debris storage behind Narrows dam about 118 million cubic yards have been allocated for the storage of tailings from new hydraulic mining.

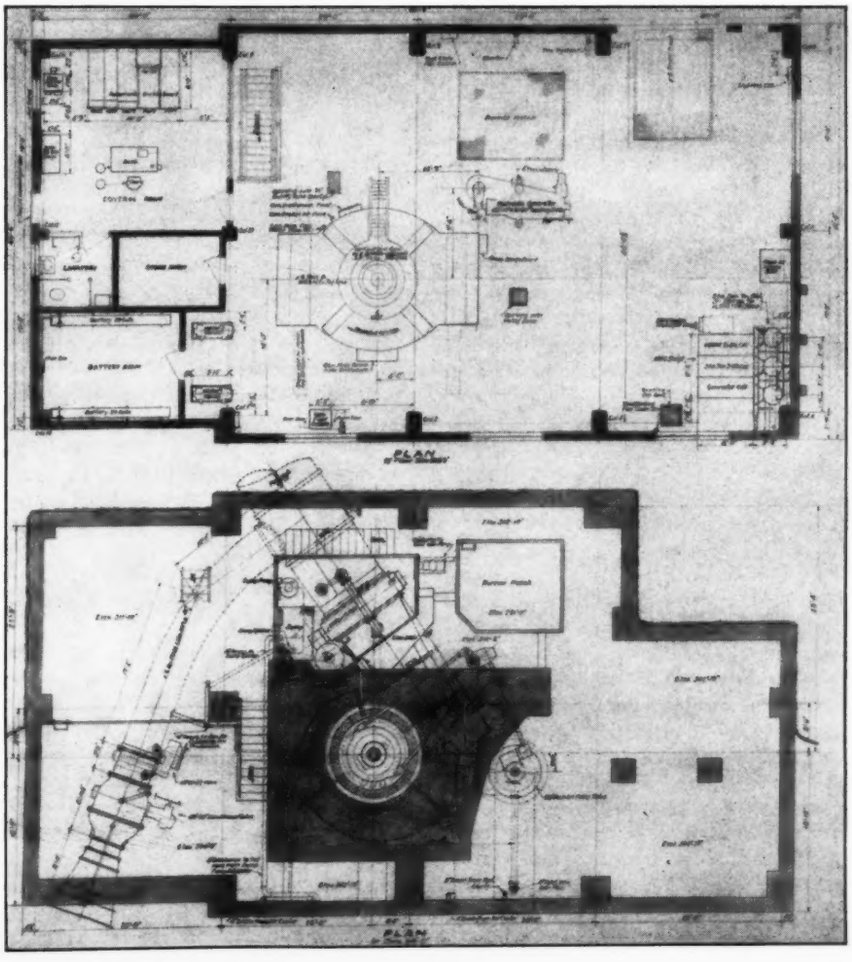
The power development as constructed is essentially the same as planned by Bonner. The reservoir outlet works were constructed by the United States. Diversion is made through a tunnel extending around the left abutment of the dam. An intake structure, supporting trash racks, is constructed at the mouth of the tunnel. The floor of the intake structure is at elevation 438 which is 89 ft. below the crest of the dam. The minimum level of drawdown in the reservoir is about elevation 450. Between this elevation and the crest the reservoir capacity, before silting, is 45,000 acre-ft. A steel roller gate which controls the flow is located in the tunnel about 150 ft. from the intake. It is operated through a vertical shaft extending from the tunnel to a gate house located above reservoir high water. The upper 650 ft. of the tunnel were constructed by the United States as part of the outlet works. This part has a horseshoe shape lined with concrete. An additional 1,060 ft. of tunnel were constructed by the company.

It was originally intended that this tunnel would be concrete lined and have the same finished dimensions as the portion included in the outlet works. However, in the driving of the tunnel considerable overbreak occurred, and, in order to save materials and to expedite the work, the tunnel was lined with gunite and the finished section changed to a horseshoe with a vertical diameter of 12 ft. and a horizontal diameter of 11 ft. 6 in., except at the lower end where there is about 85 ft. of 8-ft. diameter circular reinforced concrete section joining the 96-in. diameter penstock pipe which is concreted into the end of the tunnel to form the plug. Access to the tunnel is provided for by a 60-in. diameter pipe with a dished head in the tunnel plug at the adit used in construction of the upper 650 ft. in connection with the reservoir outlet works.

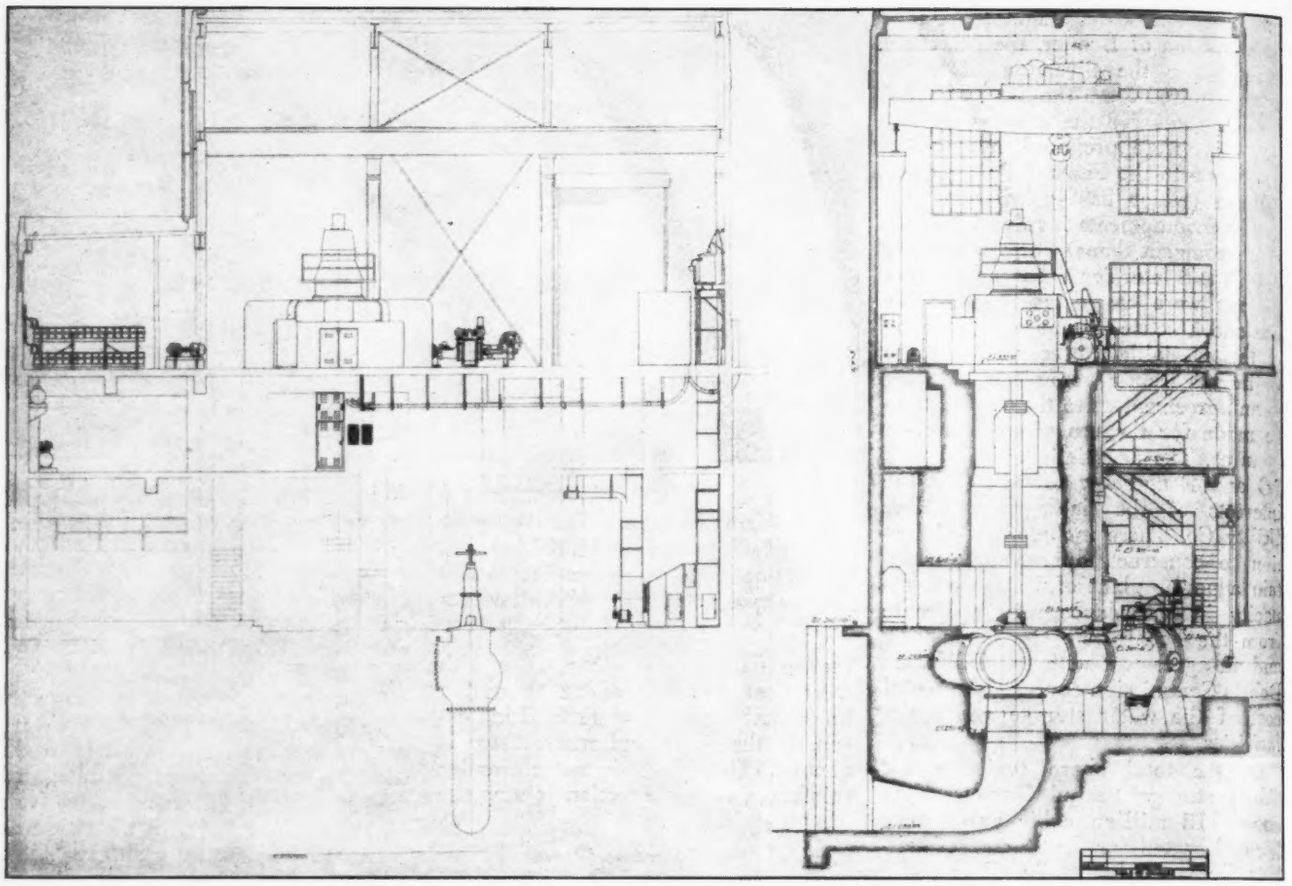


Narrows development incorporates a debris dam for restraining hydraulic mining tailings and an 11,000-kva. fully automatic power house located in the canyon 1,500 ft. down stream

The penstock is only 270 ft. long. It is of firebox quality steel, shop welded with circumferential field joints riveted with outside butt strap. The inside diameter is 96 in. Thickness varies from $\frac{3}{8}$ in. to 9/16 in. with the thickness increased to $\frac{3}{4}$ in. at a special T sec-



Plan of the Narrows Power House



Cross section of the power house. Provision is made for protection against possible flood water crest of 40 ft.

tion connecting to a 48-in. pipe leading to a 48-in. Larner Johnson valve. This connection is needed to by-pass water for downstream users at times when the turbine might be out of service.

The canyon of Yuba River for about 3,000 ft. downstream from Narrows dam is relatively narrow with steep rocky slopes. In this distance there are occasional indentations in the rocky canyon face which offer the only power house sites. The site chosen for the power house is in one of these indentations about 1,500 ft. downstream from the center of the dam. It is sufficiently removed from the dam to avoid most of the spray from the spillway. There is practically no fall in the stream for 1,500 ft. downstream from the tailrace.

Because Yuba River is subject to floods of high intensity the generator floor was located 35 ft. above low water stage. This is 8 ft. above the high stage of the flood of Dec. 11, 1937, which was the date of one of the large floods in northern California, and one for which a record of stage at Narrows power house site was obtained. In addition to having the generator floor at a high elevation the walls and door openings are so constructed that flood water can be kept from entering the power house until a stage 40 ft. above low water obtains.

The building is of structural steel and reinforced concrete. The generator room which is served by a traveling crane is approximately 42 x 60 ft. inside. An abutting structure with inside dimensions approximately 20 x 39 ft. and less than half the height of the main building, serves as a switchhouse and service space. The only access to the building is by a tramway which extends to the rim of the canyon. The power house terminus of the tramway is inside the building so that loads may be taken directly by the crane. This feature was very helpful during erection of the power house equipment.

The power house contains one vertical Francis turbine (13,500 hp.), driving a 11,000-kva. 85% power-factor generator. Power is generated at 11,000 volts, then stepped up to 66 kv. in a bank of three 4,000-kva. self-cooled transformers. There are two oil circuit breakers in the power house, one for the generator, between the generator and the transformer bank, the other for the station service transformer bank.

To insure station service power at all times when the main transformer bank is energized, the station service transformer bank is fed from the 11-kv. bus, on the main transformer bank side of the generator oil circuit breaker. The switch gear is metal clad, the oil circuit breakers are of the lift-up type.

On the high voltage side of the main transformer bank is an outdoor 69-kv. oil circuit breaker, which makes it possible to separate the bank from the rest of the system in event of transformer bank trouble, or other trouble in the power house which might fail to clear. This breaker is located within a steel tower structure which supports disconnecting switches for the oil circuit breaker and a three-pole by-pass switch, so connected as to permit taking the oil circuit breaker out of the circuit for observation, cleaning, or repairs, without interrupting the plant output. On the line side of this by-pass switch is a line grounding switch. Mechanical positive interlocks are utilized between the switch controls that prevent the closure of this grounding switch if either the disconnecting switches or the by-pass switch is closed.

Power from this plant is fed into the company system at a switching center near Smartsville.

The turbine is designed for variable head, 180 ft. minimum effective to 240 ft. maximum static. It will pass 550 c.f.s. at 185 ft. head and is equipped with a 100% relief valve. Operation of the unit will be with the relief valve

functioning as a synchronous by-pass, this being the best practical method of temporarily maintaining the flow through the plant in the event the generating unit is off the line. The unit has no governor. It is equipped with a hydraulic controller which is a combination of hydraulic cylinder and motor-driven jackscrew, functioning in the place of a servomotor. The open position of the turbine wickets is controlled by the motor-operated jackscrew. Penstock pressure is used in the hydraulic cylinder to oppose or follow the motion of the screw. Reversal of pressure on the hydraulic cylinder piston causes the wickets to close quickly. They are held in the closed position by penstock pressure until the motor-driven jackscrew follows, more slowly, to the closed position. At this point the jackscrew again contacts the hydraulic piston mechanism, holding it firmly. Interlocks prevent opening of the wickets while there is any separation between the motor-driven screw and the hydraulic piston. The motor mechanism has sufficient force to overcome the hydraulic pressure of the piston in the closing direction.

For synchronizing, minimum position limit switches are adjustable and permanently fixed at the proper gate opening to bring the unit up to synchronous speed. The hydraulic controller is located on the generator floor. Motion is transmitted through a vertical shaft 30 ft. long down to the turbine floor, then horizontally to the turbine shifting ring.

The turbine is equipped with a 90-in. diameter, hydraulically-operated butterfly valve. Operating pressure for closing this valve is taken from the penstock, and pressure for opening is taken from the scroll case thereby preventing the valve from opening until the scroll case is full. The operating cylinder is of sufficient size to close the valve under varying conditions of head and flow.

The turbine guide bearing is a babbitt-lined oil-lubricated bearing, built into the turbine head cover. It has a separate oil system utilizing two pumps, one gear driven from the turbine shaft, the other a-c motor driven. The motor-driven pump cuts in automatically on failing oil pressure and is intended for starting, stopping and emergency operations.

The draft tube is fitted with a removable section which permits lowering and removal of the turbine runner without disturbing the turbine head cover assembly. The shaft for this unit is built in three sections: The turbine shaft, a removable intermediate section, and the generator shaft. The intermediate section is without guide bearings. There are three guide bearings: The turbine guide bearing, the lower generator guide bearing, and the combined guide and thrust bearing supported above the generator housing. The generator bearings are all self-lubricated.

The generator is equipped with surface coolers. These use water at reduced pressure from the penstock as a cooling medium. It was found that the value of this water for power purposes was just about equal to the expense involved, if water was pumped from the tailrace. The cost being the same in either case, the more simple and positive method was adopted.

The generator has class "B" insulation throughout. The field has a built-in full amortisseur winding. Above the generator on the main shaft is the direct-connected exciter. The exciter field is energized from the station 125-volt battery and charging set. Two charging sets are provided. Either can be put into service, leaving the other as a spare. This arrangement makes a pilot exciter unnecessary and avoids the increase in voltage applied to the field of the exciter in the event of overspeed. This scheme of excitation is in use in two other plants and has proven successful. Generator voltage is controlled by a quick response voltage regulator, operating on the exciter field.

Fire protection for the generator is automatic. Water will be applied from penstock pressure to the generator fire manifolds, one above and one below the generator stator. These manifolds contain sufficient ⅛-in. orifices to admit from 300 to 500 gal. of water per minute; a quantity sufficient to completely drench the windings. Water can only be applied if two conditions occur simultaneously, that is, generator differential relay operates and at the same time the opening of thermostatic circuit interruptors which function if air in excess of 100° C. leaves the generator windings.

In addition to overload, overvoltage, overspeed, temperature and differential protection, the generator is equipped with an "elevated neutral." This scheme functions in a wye-connected generator as a ground detector and may be used to remove the generator from the bus if a ground occurs anywhere in the generator winding. It consists of a distribution-type transformer 6,900-220/110 volts 15 kva. connected with the high-voltage winding in series between the generator neutral and ground. The secondary is loaded to 100% of the transformer capacity with resistors. Normally no voltage appears across this transformer. If a ground occurs anywhere in the bus or generator winding, except exactly at the generator neutral, a voltage will appear across both windings of the "elevating" transformer. A sensitive voltage relay across this transformer secondary will either cause an alarm or shut down the plant as may be desired.

The main transformer bank, because of the absence of suitable space, is located at the top rim of the canyon 1,500 ft. away from the power house. It consists of four 4,000-kva. self-cooled 11/69-kv. wye transformers. Three transformers comprise the bank, one is a spare. Each transformer is mounted on rails for convenient removal. The high-voltage and low-voltage transformer busses are open type, porcelain insulated, and supported by a steel frame structure. Transfer switches are so arranged with interconnecting controls, that the operation of one control handle will completely cut out a damaged transformer and cut in the spare transformer in its place. This avoids complicated switching orders and chance of making errors. To our best knowledge and belief, this is the first time that this scheme has been used. In any event, it is the first time it has been used on the PG and E system.

The space surrounding the transformers is covered with 12 in. of crushed rock, maintaining sufficient voids to contain the oil from the transformers should an accident cause a rupture of one of the tanks. It is expected that a prolonged destructive oil fire will thus be prevented. War emergency conditions prevented an underground duct line with insulated cable between the power house building and the transformer bank, for the 11-kv. generator to transformer conductors. In its place a pole line was built supporting bare copper cable obtained from company replacement stock. An overhead ground wire was provided and for additional generator protection 11-kv. volt lightning arresters were installed and connected at the transition point where this overhead line enters insulated cable in ducts. A 60-kv. lightning arrester is connected as closely as practical to the transformer high-voltage bushings. These arresters are connected solidly to the bus on the transformer side of the line switch.

Remote control conductors for the 60-kv. oil circuit breaker and also the current and potential transformer secondaries are run in ducts to the control switchboard in the power house. The entire 11-kv. line and transformer bank are included in a balanced circuit with differential relay protection. In addition, the main transformers are protected from the line by overload and residual line current relays and

have temperature protective equipment.

This plant is automatic in its operation. This does not mean that no attendance will be provided. It does mean that attendance is not required at all times. Property of this type and importance requires at least a resident caretaker. Such being the case, the amount of training this man will need is reduced as the operation of the plant is simplified.

A plant that requires merely the pushing of a button to put into operation carrying load on the system, is really the most simple type of plant to operate. Narrows is of this type.

The closing by hand of the master element starts the automatic sequence functioning. The unit will start from standstill, build up speed and voltage, synchronize with the 11-kv. bus and take on load in the amount previously determined, and fixed by the hand setting of the load limit stop or position switch.

Water level control load which is made use of in some other automatic hydro electric plants, cannot be used here. When the inflow to the reservoir is less than the capacity of the plant, the amount of load to be carried will be determined by the desired rate of drawdown on the available storage.

If during periods while the attendant is out of the plant, the unit should shut down from "temporary" or (self-correcting) cause, the unit will again restart and take on load to the amount it was carrying when it shut down.

The elements of the automatic operation are those which have been more or less standardized by usage over the past number of years. Protective features, if possible, are duplicated in some other form. In practically no instance does the protection from damage to the unit depend on one device alone. Some form of follow-up protection is employed if possible.

Examples of this are two types of overspeed protection and the motor-driven jackscrew to overcome the hydraulic piston in shutting down.

Conditions which must be fulfilled before unit will start are as follows: 1. The master switch must be in the closed position. 2. Normal voltage must exist on the 11-kv. bus. 3. No single or reversed phase rotation shall exist. 4. All of the protective features causing lockout or temporary shutdown must be in the normal position. 5. Penstock pressure must be within the normal range. 6. The butterfly valve must be in the fully open position.

The unit is protected against exciter overvoltage, ground fault in the generator winding, overspeed, underspeed, opening the generator oil circuit breaker because of momentary voltage dips, opening the generator oil circuit breaker and field contactor on normal shutdown until the turbine wickets are completely closed, fire in the generator winding, ground fault in the generator field winding, the generator being connected to the bus without first going through the normal sequence of starting, failure of lubricating oil pressure, failure of bearing cooling water pressure.

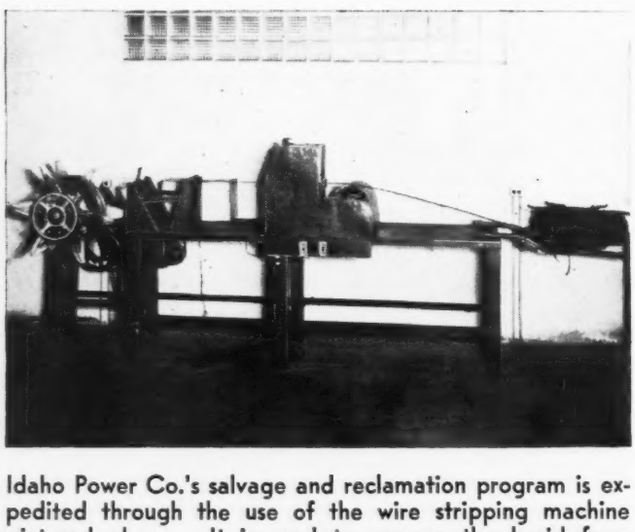
The unit will shut down temporarily after which it may restart if the trouble has been cleared, if it is subject to moderate overload causing heating in the windings, if the unit is subjected to excessive overload, or if one of the transformers overheats.

Conditions which cause shutdown and lockout are: Overheated bearing, failure of excitation, single or unbalanced operation phase, excessive a-c voltage, generator winding insulation failure causing differential relay operation, failure of winding insulation in main transformers, failure of cooling water, low d-c control voltage, ground in generator winding, ground in generator field winding, excessive overspeed, failure of station power, penstock pressure failure, and bearing oil pressure failure.

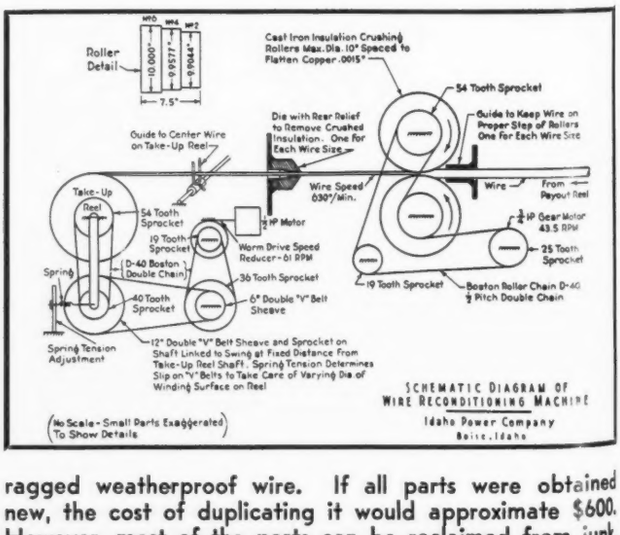
The 60-kv. transformer bank is protected against internal fault causing differential relay operation, excessive temperature, excessive overcurrent and residual line currents.

The automatic factors of the battery charging motor-generator set are: Start the motor and place the battery on charge with restoration of 220 volts a-c bus supply, disconnect the generator from the battery on failure of 220 volts a-c voltage, protect the motor from excess current, protect the generator from excessive current, and indicate ground on the control bus. Constant voltage on the battery with current compensation to limit the load on the charging generator during periods of high demand on the a-c bus is maintained. The charging generator voltage is adjustable for normal trickle charge, also for equalizing charge. Duplicate charging sets are provided and connected to a double-throw switch. Either may be cut in for normal operation with the panel equipment which is not duplicated.

When complete, the plant will include a total water flow measuring device. This will give an indication of quantity of flow, a graphic chart of quantity of flow for all hours of the day, also an integrated record of the accumulated flow through the plant. The operation of this device will be based on calibrated pitot tubes suitably located in the penstock above the butterfly and by-pass pipe.



Idaho Power Co.'s salvage and reclamation program is expedited through the use of the wire stripping machine pictured above. It is used to remove the braid from ragged weatherproof wire. If all parts were obtained new, the cost of duplicating it would approximate $600. However, most of the parts can be reclaimed from junk.


Roller Detail
10.000"
9.9572"
9.9044"
7.5"
Cast Iron Insulation Crushing Rollers Max. Dia. 10" Spaced to Flatten Copper .0015"
54 Tooth Sprocket
Die with Rear Relief to Remove Crushed Insulation. One for Each Wire Size
Guide to Keep Wire on Proper Step of Rollers One for Each Wire Size
Guide to Center Wire on Take-Up Reel
Take-Up Reel
54 Tooth Sprocket
19 Tooth Sprocket
(2-40 Boston Double Chain)
Spring
40 Tooth Sprocket
Wire Speed 630'/Min.
Wire
From Payout Reel
½ HP Motor
Worm Drive Speed Reducer-61 RPM
36 Tooth Sprocket
6" Double "V" Belt Sheave
½ HP Gear Motor 43.5 RPM
25 Tooth Sprocket
19 Tooth Sprocket
Boston Roller Chain D-40 ½ Pitch Double Chain
Spring Tension Adjustment
12" Double "V" Belt Sheave and Sprocket on Shaft Linked to Swing at Fixed Distance From Take-Up Reel Shaft. Spring Tension Determines Slip on "V" Belts to Take Care of Varying Dia. of Winding Surface on Reel
SCHEMATIC DIAGRAM OF WIRE RECONDITIONING MACHINE
(No Scale-Small Parts Exaggerated To Show Details)
Idaho Power Company
Boise, Idaho

Welding Innovations for High Dams

Arc welding as applied to penstocks of Western hydroelectric project saves $518,000 over riveted construction—Advantages include reduced maintenance costs, conservation of resources and higher efficiencies

Gilbert L. Yetter
Engineer, U. S. Bureau of Reclamation

AFTER reviewing the progress made by manufacturers of welded appurtenances common to high dams, and by heavy construction contractors in welded installations over the last decade, it is apparent that the benefits to be derived from arc welding are gaining deserved recognition. It is desired to outline in this paper a practical demonstration of an all-welded structure for a high dam now under construction, as a concrete example of what is being successfully accomplished in this field, and to point out the economic and other advantages to be derived from the fullest utilization of arc welding in heavy plate construction in preference to riveting or other methods adaptable to steel fabrication and installation. Assuming that an equal amount of similar construction will be undertaken in the next decade as has been completed in the last decade, the appreciable savings that can be accomplished by more extensive use of welding will be noted.

The installation consists of five all-welded penstock systems with two station-service penstocks. The upstream portion crossing the dam was embedded in concrete, and the lower bends of each are likewise to be embedded in concrete. Two expansion joints in each make the necessary provision for expansion and contraction with seasonal temperature changes. All-welded structural steel supports are used throughout the embedded portion, with steel rocker casting supports working in conjunction with structural steel rings attached to the penstocks at 50-ft. intervals outside of the dam and anchors.

The penstocks are designed to deliver water from the reservoir, under heads up to 480 ft., to five 103,000-hp. turbines and two station service units in the power house. They were fabricated near the damsite because their 15-ft. diameters were too large to permit ready delivery by rail. Steel plates varying in thickness from ¾ to 2½ in. are welded into cylindrical sections 20 ft. in length and consisting of two courses of two plates each. The completed penstocks range from 800 to 950 ft. in length and the individual sections weigh from 25 to 70 tons.

At the start of welding operations, two formed, semicircular plates were assembled and tack welded together to form a cylindrical section 10 ft. in length. These cylinders were held in truly circular shape by all-welded spreaders, while the longitudinal seams were welded. The spreaders had equally spaced radial bolts welded to a central hub, and the other end threaded into nuts spotwelded to interior pipe surfaces. With the bolts engaging these nuts, the bolt tension was adjusted so that the section is tightly held to circular shape.

The longitudinal welds were made by moving the cylindrical section lengthwise at a slow, uniform speed under an a-c automatic welding head attached to an adjustable arm. The speed was suited to the most appropriate welding speed. Two cylindrical sections were then mechanically fitted and tack welded, after which the circumferential seam was automatically welded by the same welding head during rotation on the same apparatus. Fig. 1 pictures the automatic welding method in use.

Wherever possible, all welding was performed by the single pass method. Repairs where necessary as well as field welding were made by manual welding using the shielded-arc process with heavily coated electrodes. The automatic welder head was mounted so that its supporting arm could be raised 16 ft. above the welding table. Thus the head could function inside or outside in practically any straight line position. The welding apparatus remained stationary, while the work moved.

This apparatus was designed to complete a welded seam in two passes in plate thicknesses up to 2½ in. inclusive. The first bead was made so as to fuse the metal to half the plate thickness. The second bead, which completed the weld from the opposite side penetrated deeply into the first bead effecting a homogeneous bond and accomplishing complete fusion with practically no line of demarcation evident.

Voltage was held constant, with the current flow varied up to 1,880 amp. to provide the most thorough fusion. The welding head controls were within easy reach of the operator. The welding speed averaged 10 in. per min.

To maintain accurate control of automatic welding quality, tests of each plate thickness were made by standard methods before production of a particular thickness was begun. In addition, a 6x15-in. test coupon was attached to the end of each longitudinal seam and thoroughly tested before acceptance of the section. In this manner, the maintenance of uniformity and high ductility so essential to this type of construction, was assured. The stress relieving practice was also checked in this manner. All manual welding operators were qualified by standard methods.

Welding electrodes for automatic welding were supplied in 150-lb. coils fed mechanically and thus avoiding frequent delays for replenishment. The electrodes were ¼ to 5/16 in. in diameter; the copper coating assuring efficient electrical contact. To protect the molten weld from detrimental impurities that would otherwise form in the weld, a powdered flux was used. The arc was hidden beneath this flux, a portion of which was melted and the balance reclaimed.

Data and illustrations from a study submitted to the James F. Lincoln Arc Welding Foundation in its recent $200,000 Industrial Progress Award Program for reports and advances and improvements made by the application of arc welding in design, fabrication, construction and maintenance. The 2½-year welding study, in which 408 awards were made, indicated a possible annual cost savings by arc welding of $1,825,000,000, including 7,000,000 tons of steel and 153,000,000 man-hours of labor.

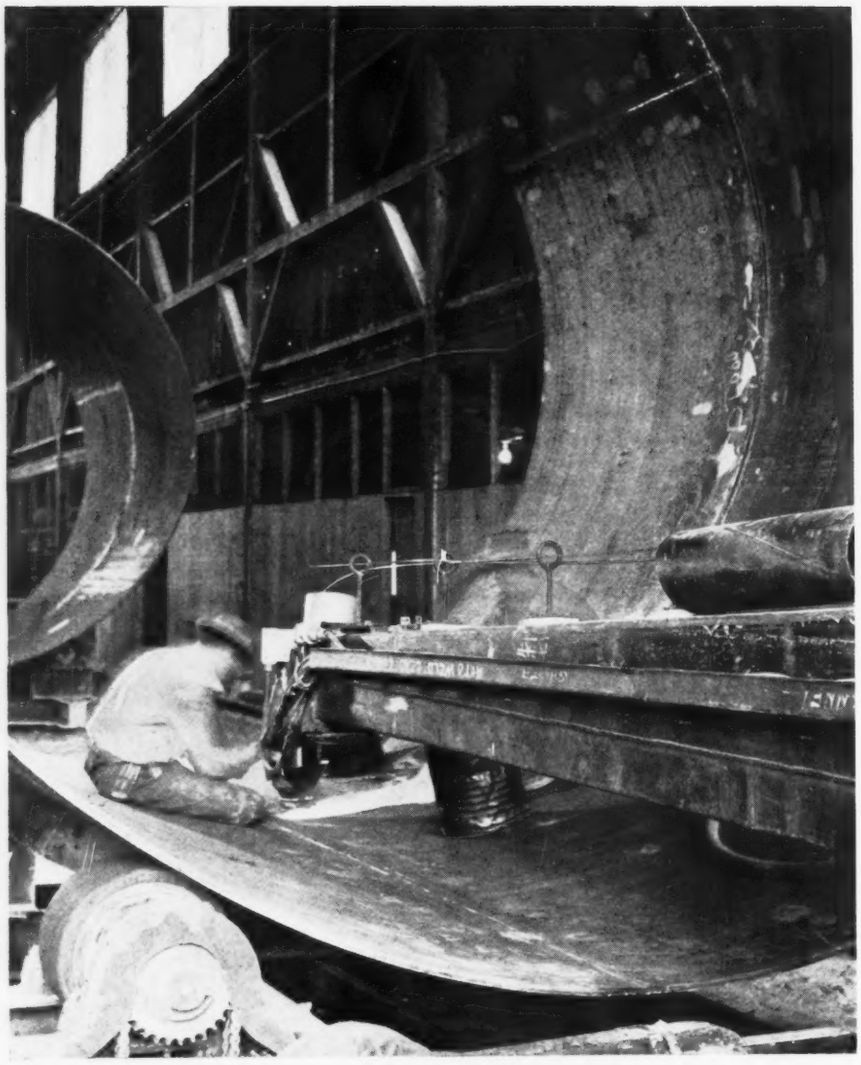


Fig. 1—Automatic welding equipment used for making circumferential welds

Radiographic examination was made of all welded seams. The shop X-ray apparatus was placed on the outside of the sections and the exposures taken inwardly, while the field X-ray apparatus was placed on the inside of the penstock and the exposures taken outwardly. Some 30,000 were required.

After completion of radiographic examination, each penstock section was placed in an annealing furnace and heated to 1,100° F. and held for a fixed period. The furnace was a car-bottom type, fired by 20 burners with special insulating brick lining to insure uniform temperatures. Liquid butane, which passes through a vaporizer under forced draft before reaching the burners was used for fuel. Close temperature control was maintained and recorded by use of thermocouples at various furnace locations leading to an automatic recording thermometer. Sections up to 23 ft. in length by 15 ft. in diameter were thus stress relieved. Fig. 2 shows the annealing furnace used.

Upon completion of radiographic examination, each section was subjected to a hydrostatic test pressure equivalent to 150% of the working pressure. For this purpose an all-welded testing apparatus was constructed as shown by Fig. 3. Test pressures ranged from 185 to 550 lb. per sq. in.

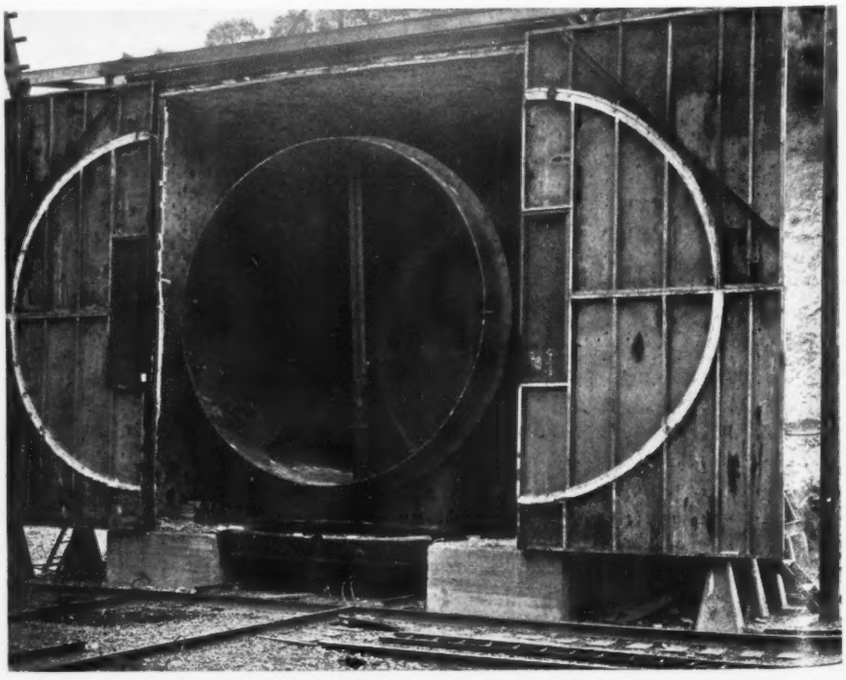
Individual sections were installed in position at the dam and the field round seams manually welded, X-rayed and will be finally tested hydrostatically upon completion of installation.

In addition to the penstock systems, two-piece welded bulkheads were welded to the upstream ends of each system to facilitate hydrostatic testing and allow work to continue downstream after the reservoir is filled to that elevation before control gates have been installed. Approximately 1,500 tons of all-welded trashrack structures are placed over the penstock adits to prevent debris from going through and damaging power units. Approximately 1,000 tons of all-welded, 102-in. diameter conduits provide 18 channels for discharge of flood waters through the spillway section of the dam.

A comparison of the costs of the penstock system as welded complete and the estimated cost if riveted shows the advantage of welded construction from a financial viewpoint. Tables I and II give the details.

Assuming conservatively an approximate consumption of 6,250 tons annually of similar material at an approximate cost of $1,500,000 by the

Fig. 2—Annealing furnace for treating sections of 15-ft. diameter pipe



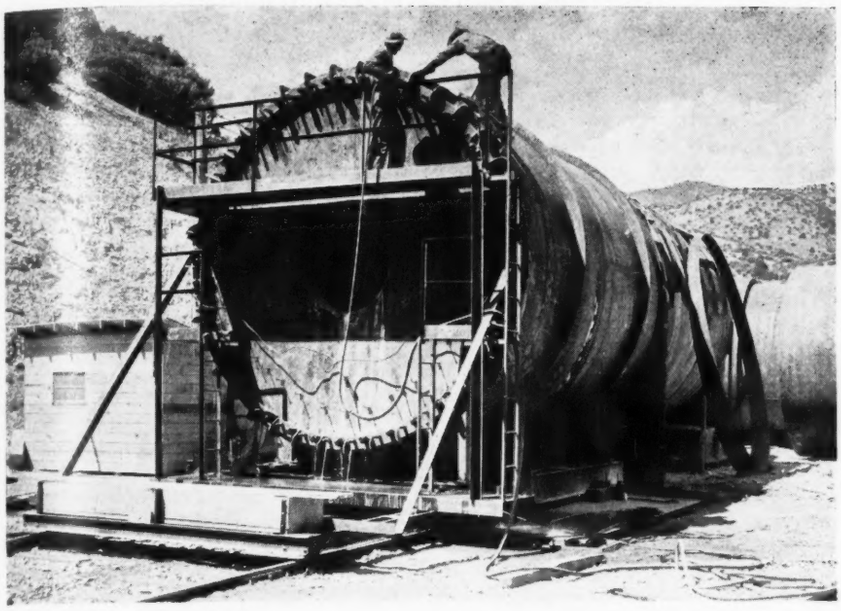


Fig. 3—All-welded testing apparatus subjected penstock sections to hydrostatic test of 150% working pressure

project with which the author is connected, a saving of $486,000 is effected annually by the use of welded construction. The estimated savings by industry in general in similar types of construction is believed to be at least ten times as much, although this is difficult to estimate without published figures on the subject.

Estimate figures herein are based on actual figures and estimates of materials taken from latest issue of the *Engineering News-Record*.

To those familiar with the subject, there is no comparison between the service life of the two types of construction, as welded construction lends itself to easy maintenance at low cost, whereas riveted construction requires constant vigilance and nuisance repairs and calking from which the welded type of construction is entirely free. X-rayed welded seams are at least 90% efficient whereas the maximum efficiency obtainable with riveted joints is 70%.

Table I—Estimated Cost of Completed Penstock Systems (as all welded complete)

Description	Quantity	Unit	Unit Cost	Total Cost
Plates	13,700,000	lb.	.07	$ 959,000
Rings and straps	898,000	lb.	.07	62,860
Structural	988,000	lb.	.04	39,520
Structural (special)	26,500	lb.	.06	1,590
Heads	121,000	lb.	.20	24,200
Manholes, etc.	66,000	lb.	.16	10,560
Castings	195,000	lb.	.19	37,050
Field erection	15,994,500	lb.	.01	159,945
Welding				165,000
X-raying				49,500
Stress relieving				22,152
Testing and painting				147,300
Supervision, general expense, overhead and profit				162,000
Total				$1,840,677

Table II—Estimated Cost of Similar Penstock Systems (if they had been riveted)

Description	Quantity	Unit	Unit Cost	Total Cost
Plates	13,700,000	lb.	.07	$ 959,000
Structural	1,014,500	lb.	.04	40,580
Rings and straps	1,071,600	lb.	.07	75,012
Drilling	120,000	each	.061	7,320
Countersinking and reaming	120,000	each	.07	8,400
Necessary welding	10,000	lineal ft.	.60	6,000
Accessories	1,302,500	lb.	.1625 (ave.)	211,656
Field erection	17,088,600	lb.	.03	512,658
Riveting	119,900	each	.50	59,959
Calking, at least	50,000	lineal ft.	.13	6,500
Testing and painting				188,700
Supervision, general expense, overhead and profit				283,000
Total				$2,358,776
Calculated savings of welded over riveted				$518,099 — 27.6%

The principal advantage of welded construction at this time lies in the conservation of resources and stocks of difficult to obtain materials that can be utilized in the war effort.

One great advantage of welded applications for high dams is the availability of equipment and labor for other classes of welding that are needed suddenly and unexpectedly to keep the general construction moving with little or no delay, and accomplish needed repairs in the minimum time.

Air Raids

EEI issues instructions for wardens regarding wires

BECAUSE the majority of air raid wardens are not technically trained and do not have experience in handling electric facilities, the Accident Prevention Committee of the EEI has compiled a set of suggestions relating to emergency conditions in streets affecting electric service facilities. These have been turned over to OCD for publication.

The suggestions begin with a warning that the warden should take nothing for granted, pointing out that any fallen or exposed wire or cable should be assumed to be "live." It also warns of the danger of low voltage shocks. It gives the following specific instructions:

"Keep everyone, including yourself, well in the clear. See that such fallen wire or cables or damaged poles are carefully guarded by means of rope or barricade, until utility repair crew arrives. Divert traffic if necessary.

"Report conditions found to your control center immediately.

"Stay on the ground. Never attempt to climb poles, towers or structures to investigate electrical incidents, to clear live wires or to extinguish electrical fires. Keep in the clear and wait for utility crews."

The suggestions warn that any metal is a conductor and that wet ground is especially dangerous. The danger of using water to fight electrical fires is emphasized. "Beware of the amateur electrician or other unauthorized person who offers his services," the report warns.

In case of inability of utility crews to reach the area of damage, the report suggests ways of clearing "live" wires in extreme emergencies. It also tells how to rescue a victim of electric shock from contact with a wire and points out the need for immediate application of artificial respiration.

Distribution Fundamentals

Dear George:

A PROFIT is without honor in someone else's cash register, and the man who lights a five dollar bill looking for a one never makes much music on the keys. Since a man is known by the Company that keeps him, it isn't a bad idea giving a few thoughts towards keeping good company.

Poles being about the biggest single item of investment in distribution systems, it's a pretty important matter to sit down once in awhile, peel off the bark and see what makes 'em full of ticks.

All poles were once virgins of the forests and remained such until they were axed. But from the time the lumberjack hollered "Timber," the pines, cedars, chestnuts and others that bit the dust took the oath of allegiance for front line service.

Poles are what power companies set in alleys to serve as supports for clotheslines, basketball backstops, billboards for political posters, fire escapes for stray cats and, incidentally, to keep their wires up out of the way of delivery trucks. However, they can't keep the poles out of the way.

The first big push westward by the poles was completed in 1861 when Western Union decided the Pony Express riders needed a rest. This line went through Indian country and the red man thought the white man was really nuts for setting up dead trees and tying them together with wire. The Indians gave these poles an in-place groundline treatment with their tomahawks which was very effective in causing a lot of them to fail.

Trees have two kinds of wood, heartwood and sapwood. The heartwood is the dead wood and is just as dead in a live tree as in a dead one. The sapwood is the live wood surrounding the heartwood, and in time dies and becomes heartwood. A lot of men have the idea that heartwood is stronger than the sapwood because it's harder, but the strength is the same for either. The outside sapwood really gives a pole a high percentage of its strength—thus the importance of handling it with kid gloves.

A pile is a truncated cone (don't worry, its bark is worse than its bite) and anything with a name like that is entitled to mathematical analysis. So the double integral slickers tell us that its weakest section depends on the taper. The weakest point will be at a point where the pole diameter is 1.5 times the pole diameter at the point of the lateral load application, but not below the groundline. For example suppose a lateral load is applied to a pole set solidly in the ground, at a point two feet from the top where the pole diameter is seven inches. The weakest section therefore will be at the point where the diameter is 10.5 in., provided that point is at or above the groundline. Thus the reason so many poles break off above the groundline when a twister hits them.

The lack of knowledge sometimes breeds confidence which is probably one of the reasons for so many giants of the forests having appeared in the pole lines around the U. S. Using a rule of thumb can throw a man for a ten-yard loss when applied to pole strength, since it goes up as the cube of the diameter. Before pole treatments were in vogue, large poles were the thing, since after ripeness comes rot and the bigger they are the longer it takes them to fall. But now a pole is as good as its treatment. Save the sapwood and you practically save all. Thus a treated pole can now be selected for the job it has to do and, no matter how thin you slice it, that's economics.

"A good Pol-eseman"

Generally, it's what a man can't see that worries him, but in the case of a pole, what he can't see is buried like Captain Kidd's treasure and forgotten. The reason is that in general the center of a pole contributes very little help to the outside. A pole with a 12 in. diameter at groundline is only weakened about 10% if the center six inches is removed. It's the outside three inches that can take it from an 80-mile norwester.

Married men don't live longer than single men—it just seems longer. There's about the same play between large and small poles—the large ones only seem better. A class seven 35-ft. pole will hold up three number fours, a 25-kva bug and two 200-lb. linemen and laugh it off as kids' play. So why all the oversize?

A lot of men in the line department and crews only try half as hard as they could to do the job on the black side of the ledger. The bosses' viewpoint ought to get a little support, and a little study and thought on any subject that concerns the company's expenses will pay six cents on the dollar, and there's a chance of time off for good behavior. And now's the time to start.

Yours,

The Old Soup

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Every Machine Tool in the City Indexed

A mutual aid for both prime and subcontractors to share and speed war production now, it will enable the L. A. Bureau to help postwar industry

ANY far-sighted business these days has two objectives. First it wishes to do all in its power to win the war, the sooner to return to the second, a peacetime basis of service to the people of this country. With a utility, whether publicly or privately owned, this two-fold objective is acutely felt. The shift from its peacetime operations to aid in all-out war production has been complicated by the necessity to maintain as good service as possible for the civil population at the same time. And when the time comes to change gears back to peacetime service, the reabsorption of the tremendous war production loads in civil utilization of power will be an undertaking of monumental size.

When a project serves both these ends, it is worth emulating. Even if the time and effort expended may seem initially large, that saved in application of the data pays off in large dividends.

Such a project is the extraordinarily complete and useful machine tool survey and index conducted for all Los Angeles territory by the Los Angeles Bureau of Power & Light in cooperation with representatives of the U. S. Army Air Corps, Army Ordnance Department, War Production Board, Los Angeles Chamber of Commerce and International Business Machine Co. For the bureau the work was assigned by Business Agent Charles C. Snyder to the industrial coordination unit under supervision of C. H. Dye. The U. S. Army Air Corps assigned Fred Vincent, engineer, the War Production Board C. W. S. Parsons, mechanical engineer, the Ordnance Department loaned two officers and to these men much credit for the successful completion of this project is due.

How It All Started

Early last year it became evident to the War Production Board that the employment of the vast existing supply of machine tools widely separated in hundreds of small plants and factories would save quantities of critical materials and even more critical time in tooling America for war production.

The Los Angeles Chamber of Commerce made a survey of 391 Los Angeles area factories and published a list of its findings. While this was a commendable undertaking and undoubtedly served as a basis for obtaining a great deal of work for Los Angeles manufacturers, the information lacked enough essential detail about the capacity and condition of the machine tool equipment listed as to require further investigation before the most effective use could be made of the material.

Listed only by company name, the location of a specific machine tool occasioned considerable search of the files or index. Then too, there were no data as to whether the shop or factory named had available time or personnel to take on more work for its tool equipment listed in the survey.

Because of a two-fold interest, the utility believed that this preliminary survey should be augmented by more complete information. Beside its interest in helping in the war effort, the Bureau of Power & Light had at stake also the fate of many small manufacturing plants, which unless converted to war production subcontracting, might be forced out of business. Individual concerns in general were too small in themselves to handle prime contracts, but specific parts of a larger prime contract could be handled if the plants having required machine tools could be located for the prime contractor or the procurement agency.

In addition it was known that a number of procurement agencies and manufacturers required finished and semi-finished articles critical to the war effort. There were other rather large manufacturers who had men and machines available for increased production if war work could be directed to them.

Management of the bureau felt that perhaps the utility was in best position to undertake such a survey, classify all the information, and keep the information current. It was also best equipped to direct war production contract work to these customers, and certainly as a war contribution to its own industrial customers nothing could be as important and useful. Looking to the future, such a file will be of prime usefulness in aiding these same factories and industries to get back into civilian production and thus save much of the industrial load for the utility as well.

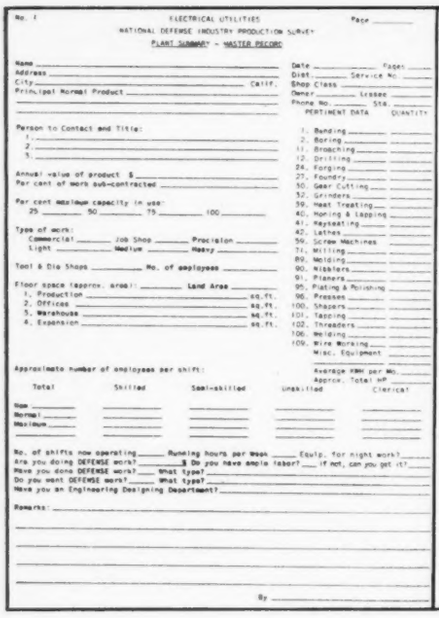
A More Complete Survey Form

The "Index Classification — Shop Machine Facilities" form 16-24969-1, which was being used nationally was made available. However, it did not provide space to record full information as to the make, model, size, age and condition of each machine tool, nor give any data as to the plant, its management, manpower or availability for more war work. Representatives of the U. S. Army Air Corps, Ordnance Department, and War Production Board were called in and working together a more complete set of survey forms were developed. In all, there are ten forms, supplemented with nine blueprints.

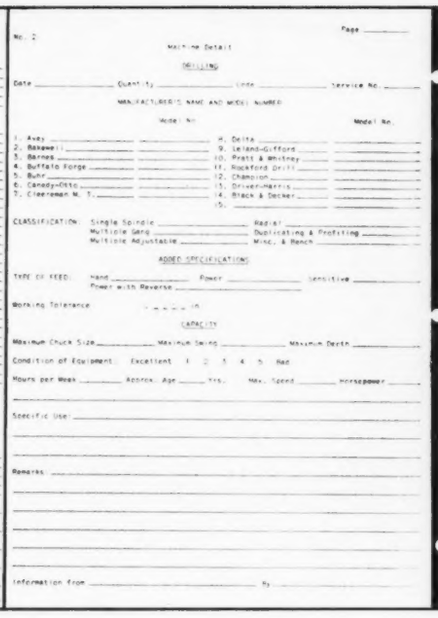
Instead of one sheet containing a check list on which to record the number only of common types of bending, boring, broaching, drilling, forging, foundry, gear cutting, grinding, heat treating, honing and lapping, key seating, lathe, screw machine, milling, molding, nibbling, planer, plater and polisher, press, shaper, tapping, threading, welding, wire working and wood working machine facilities, (as provided in the U. S. government printing office form 16-24969-1) a separate form was provided for each general type of machine.

A master record or plant summary sheet contained the quantity of such machines but went further. It likewise listed the name of the plant, address, principal normal product, name of person to contact and his title, annual value of product, per cent of work subcontracted, per cent maximum capacity now in use, type of work done (whether commercial, job shop, or precision, light, medium or heavy), whether it had a tool and die shop, its floor area, number of employees, employees per shift, number of shifts operating, hours per week, whether equipped for night work, whether doing war work and what type, whether ample labor was available, whether war work was wanted and what type, and whether it had an engineering design department.

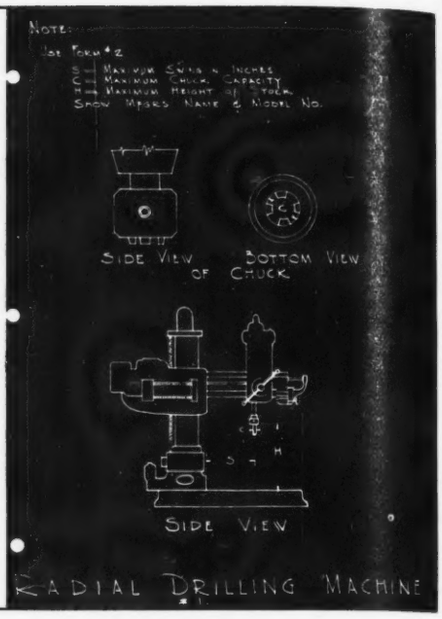
Then for each type of machine there was a machine detail sheet, one to be filled out for each machine unless there were more than one of identical make and size. These sheets were made up for drilling; gear cutting; grinding, honing and lapping; boring and turning equipment; shaping and planing; forming, punching and stamping; milling and keyseating;



Master survey of each plant



Detail sheet for each machine



Typical blueprint

woodworking, and miscellaneous machines. Each of such sheets designated the quantity, make of machine and model number, type, capacity, drive, age and condition, speed, horsepower and any further pertinent information.

Whom to Survey

Individual consumer cards of the bureau, kept in an International Business Machine code card system, could be sorted automatically to derive a list of business and industrial customers. Each card contained a service number, a ledger book number, a classification code in numbers for card punching, a classification code in letters to designate the business or type of service, as well as the name of the customer, connected horsepower, street address and district. A business or use code had been employed by the bureau for years to designate and when necessary to segregate types of business or occupancy served. This came in very useful during the survey.

Production plants with 25 hp. and over were selected as a minimum basis for the survey. This basis, it was felt, would be approximately the same as that requested by the Division of Contract Distribution of WPB, namely, shops with 25 employees or over. However, it also was felt that a number of shops doing assembly work might have less than 25 hp. but employ more than 25 people, and so the power consultants in each district were asked to check their records and report the names of such plants to the coordination staff.

The master list of all consumers was then checked against all the available information contained in the previous Chamber of Commerce survey and any other sources of information, in order that the master record sheet for each customer could be compiled as completely as possible before an individual plant-to-plant visit was made.

Procedure from then on is well outlined in the following instructions for making the field survey given to the survey staff made up from members of the bureau and War Production Board.

Preparing the Field Kit

When all data have been compiled for individual consumers on master record forms, together with other attached information, listings should be filed (alphabetically or by street number) and routings should be arranged. The number of plants which can be surveyed by any one engineer per day will naturally depend upon the amount of information at hand, the number of pieces of equipment, the size of the consumers' plants, accessibility, and various other controlling factors.

The field kit will contain:

1. The individual consumer master record sheet (filled in as completely as possible).

2. Copy of individual consumer's utility load record of machines connected.

3. Copy of plant data and equipment by industrial department of Los Angeles County Chamber of Commerce, if available.

4. Copy of facilities record as filed with the WPB Contract Distribution Division, if available.

5. Copy of "Index Classification—Shop Machine Facilities" (Form No. 10851). (Same as 16-24969-1).

6. Complete set of utility's field record survey forms. (Special forms developed for the purpose.) One form shall be included in the kit for each individual machine tool.

Note: One form is to be used for each machine unless machines are exactly alike.

These forms consist of the following:

Form No. 1—Plant summary—master record.

Form No. 2—Machine detail—drilling.

Form No. 3—Machine detail—gear cutting.

Form No. 4—Machine detail—grinding, honing, and lapping.

Form No. 5—Machine detail—boring and turning equipment.

Form No. 6—Machine detail—shaping and planing.

Form No. 7—Machine detail—presses: forming, punching, and stamping.

Form No. 8—Machine detail—milling and keyseating.

Form No. 9—Machine detail—miscellaneous (includes: bending, broaching, heat treating, molding, nibblers, plating and polishing, tapping, threading, welding, and wire working).

Form No. 10—Machine detail—woodworking.

7. Descriptive copies of manufacturers' machine tool manuals or catalogues.

8. Letter of identification from WPB, together with clearance from armed forces in charge of plant protection.

9. One clip-board or hard-tack 8½x11 in. binder.

10. Suggested written instructions of the general approach to each individual consumer.

The Survey—General Instructions for Field Engineers

1. Become familiar with all forms to be used and how information is to be recorded.

2. Assemble catalogues, etc., giving description of machine tools.

3. Study available material of each individual plant before starting actual field survey.

4. Before contacting any consumer in the field be certain that a definite appointment has been made satisfactory to all concerned. Know whom you are to see and work with.

5. Be thorough in your survey, ask questions, and include (under "Remarks" on form sheet) any special information, such as outlined in the special instructions.

6. *IMPORTANT*—One form sheet is to be used for each individual model or make of machine. Two or more machines can be recorded on one form only when machines are exactly alike.

SPECIAL INSTRUCTIONS FOR USING FORMS

Form No. 1—Master Record, under "Remarks":

a. Give a brief outline of plant and any information gathered in regard to ability or previous experience of the management.

Form No. 2—Drilling:

a. Single spindle (under "Classification") means a single drill used at one time. These could be mounted as: two or more single spindles in a row; on the same bench or stand. The total number thus mounted in one group should be so marked in "single spindle" extension. Thus, for example, the machine code for five single spindles grouped would be coded (in accord with National Survey Form):
   No. 13—5, if drill size to 1 in. capacity, inclusive
   No. 14—5, if drill size over 1 in. capacity, inclusive

b. Multiple spindle means "multiple gang," or number of spindles used in gang, i.e., used in same operation same time, with similar or variable sizes of drills. Thus, for example, the machine code for an eight-gang (multiple spindle) drill would be:
   No. 15—8, if drill size to 1 in. capacity inclusive
   No. 16—8, if drill size over 1 in. capacity inclusive

c. Note under "Remarks" any special features, such as: quick change drill chucks; power feed; etc.

Forms in General

a. Under "Remarks":
   1. Include any special additional data pertaining to a specific machine that may assist in identifying it at any future date.
   2. List total number of running hours machine is used per week and the average number of hours on each shift per week.

b. Item "hours used" means total number of estimated hours that machine is now used per week.

c. 150 hours per week shall be basis as 100%, maximum time machine can be used per week.

MACHINE CODE NUMBER

As soon as the field man completes his survey on each machine, he should fill in nearest machine code number (from 1 to 110, inclusive) that corresponds to the national survey form code number. This number may be changed later, but it will be very valuable as it directly ties the two forms together, from the field man's point of view.

The instructions to field survey men ended with an appeal for accuracy and speed in the interests of aiding the war program.

Coding Makes of Machines

To brief as much information on one small card as possible, before sending the survey sheets to the IBM card punches, a standard coding of manufacturers was necessary. This required some adjusting of so-called standard manufacturers' codes. Likewise coded were the types of machine tools manufactured, and these were listed together with the manufacturer's code on the form. With this code complete, then, all survey sheets were properly marked with the appropriate code symbols for the tabulating operator to follow.

The survey sheets were then sent to the key punch operator and an individual card made for each separate machine tool in Los Angeles. In all more than 60,000 cards were handled, which when sorted down to live working cards resulted in a file of 40,000 cards, representing 1,500 factories individually called upon and surveyed.

Each IBM card in the file now contains the customer's service number, name, machine code, tool manufacturer's name, age and condition of the machine. If an inquiry is made, for example, as to what companies in the area have a bench lathe with a 9-in. swing, 18-in. center length, with a 1-in. capacity through spindle, the cards for lathes can be run through the sorting machine and will be selected automatically.

The card files are arranged as to makes of machines and sizes. But to make all this valuable storehouse of information available and useful as well as current, still more steps were required. A complete ledger sheet, however, of all the machine tools in all plants was run off to be kept in a separate and safe place in case of any emergency requiring a duplicate of all these data.

Machine Tool Manufacturers

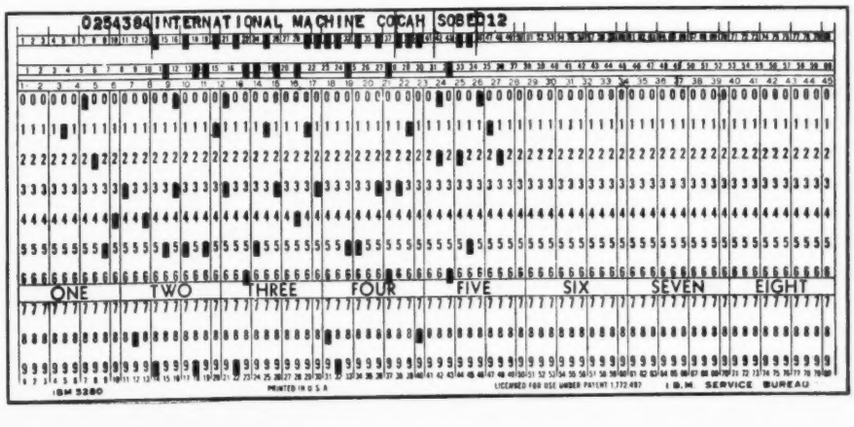
Mfrs. Code	Machine Code	Name	Location	State
GOSS	C	Goss & deLeuw Mach. Co.	New Britain	Conn.
GOEB	FJ	Gould & Eberhardt	Newark (Irv)	N. J.
GRAB	CKP	Grabo Mach. Works, E. O.	New York	N. Y.
GRNT	QV	Grant Mfg. & Mach. Co.	Bridgeport	Conn.
GRAY	DE	Gray Co., G. A.	Cincinnati	Ohio
GREN	T	Greenerd Arbor Press Co.	Nashua	N. H.
GRLE	BC	Greenlee Bros. & Co., Inc.	Rockford	Ill.
GROB	OP	Grob Brothers	Grafton	Wis.
NBGC	C	Gridley—New Britain Mach. Co.	New Britain	Conn.
GFLD	Q	Greenfield Tap & Die Co.	Greenfield	Mass.
GRKL	C	Greaves-Klusman Mach. Co.	Cincinnati	Ohio
HAMI	BC	Hamilton Tool Co.	Hamilton	Ohio
HAMM	KN	Hammond Machy. Builders	Kalamazoo	Mich.
HAMM	B	Hammond Mfg. Co.	Cleveland	Ohio
HANC	K	Hanchett Mfg. Co.	Big Rapids	Mich.
HANA	TV	Hanna Engr. Works	Chicago	Ill.
HNFN	TV	Hannifin Mfg. Co.	Chicago	Ill.
HARD	CD	Harding Bros. Inc. (Cataract)	Elmira	N. Y.
HASK	Q	Haskins Co., R. G.	Chicago	Ill.
HELD	AK	Heald Machine Co.	Worcester	Mass.
HNDY	BCD	Hendey Machine Co.	Torrington	Conn.
HNWH	RSTU	Hendley & Whittemore (Beloit)	Beloit	Wis.
HEWR	BT	Henry & Wright Mfg. Co.	Hartford	Conn.

Portion of the code used to classify makes of tools and types for IBM cards

Keeping in Contact With Plants

All these data would be of little value either to the war effort or to the bureau's industrial customers without a program to make the information available to the properly qualified Army, Navy, War Production Board, prime contractors or subcontractors who might endeavor to locate machine tool capacity and time for war production subcontracts. Consequently a consumer's work card and a file folder was made up for each consumer. The work card carried spaces to note the date, the annual volume in $1,000, the per cent of maximum capacity working, the number of employees and separate notation of the number skilled, number

Finished IBM index card punched from information obtained in the survey. At the top edge, left to right, are the utility's service number, name of customer, machine code indicating "bench lathe, 9-in. swing, 18-in. center, length 1-in. capacity through spindle"; manufacturer's name "South Bend Lathe Works"; age and condition of machine, (1 yr. old—2 condition.) Each machine has a card



of shifts being worked, number of hours per week and per cent war work. This card was kept active by regularly repeated phone call-backs. It gave at a glance an indication of the activity in each plant, and where the concern was in distress and needed war contracts, the card could be flagged and thus given more attention.

The file folder contains the survey sheets of tools possessed by each customer and any other pertinent information concerning that customer—letters, data, etc. One of the novel and useful features of this file is that when the firm is called, either in a routine check each month or on some special prospect for work for the plant, a brief record of the conversation is noted on the flyleaf of the customer's file. This is like the doctor's case history card and enables the person making another telephone call later to contact the right person, recall previous subjects discussed, use the information as a lead to bringing file data up to date.

Machine Tool Index

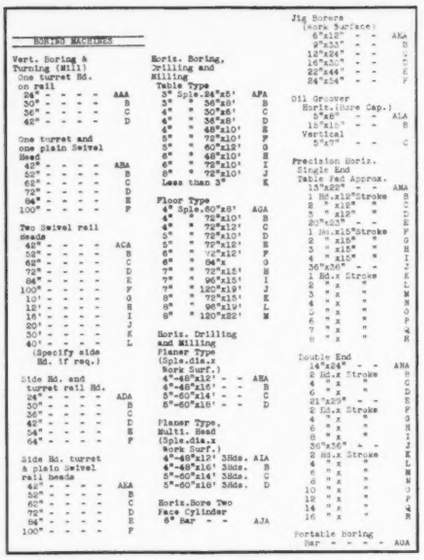
So much for help for the possessor of machine tools, how was all this information to be condensed and made accessible to the war producer or prime contractor, the Army, Navy or Maritime Commission? In condensed form a Machine Tool Index was mimeographed and bound for distribution to those agencies and prime contractors engaged in war work. The fly leaf contains these words:

"If you are manufacturing an item which requires time on machine tools listed in this index and which you do not possess, call MIchigan 4211, station 471. We will consider it a privilege to help you locate a concern to process work for you."

Directions tell such a seeker to determine the tool needed to do the specific operation, then turn to a page containing a key to the machine code. In the index itself under each general class of machine are listed the various types of machines by name and size and a code number. By calling the bureau coordinators, giving the name of the machine or the three-lettered code representing that machine, the names of several firms having such machines will be given the inquirer. The negotiations for use of that machine are then carried on between the two interested parties. If those listed are reported back as too busy, more names are furnished.

Results

Any attempt to compute the total results in business distribution among the customers of the bureau derived from this service would be subject to some possible argument as to whether



BORING MACHINES

Vert. Boring & Turning (Mill) One turret Rd. on rail
24" - - - - AAA
30" - - - - B
36" - - - - C
42" - - - - D

One turret and one plain Swivel Head
42" - - - - ABA
52" - - - - B
62" - - - - C
72" - - - - D
84" - - - - E
100" - - - - F

Two Swivel rail heads
42" - - - - ACA
52" - - - - B
62" - - - - C
72" - - - - D
84" - - - - E
100" - - - - F
110" - - - - G
120" - - - - H
140" - - - - I
160" - - - - J
200" - - - - K
300" - - - - L
400" - - - -
(Specify side Rd. if req.)

Side Rd. and turret rail Rd.
24" - - - - ADA
30" - - - - B
36" - - - - C
42" - - - - D
54" - - - - E
64" - - - - F

Side Rd. turret & plain Swivel rail heads
42" - - - - ASA
52" - - - - B
62" - - - - C
72" - - - - D
84" - - - - E
100" - - - - F

Horiz. Boring, Drilling and Milling
Table Type
3" Spls.24"x5' APA
3" " 36"x8' B
4" " 30"x6' C
4" " 36"x8' D
4" " 48"x10' E
5" " 72"x10' F
5" " 60"x12' G
6" " 48"x10' H
6" " 72"x10' I
8" " 72"x10' J
Less than 3" K

Floor Type
4" Spls.60"x8' AGA
4" " 72"x10' B
4" " 72"x12' C
5" " 72"x10' D
5" " 72"x12' E
6" " 72"x12' F
6" " 84"x G
7" " 72"x15' H
7" " 96"x15' I
7" " 120"x19' J
8" " 72"x15' K
8" " 96"x19' L
8" " 120"x22' M

Horiz. Drilling and Milling
Planer Type
(Spls.dia.x Work Surf.)
4"-48"x12' - - ASA
4"-48"x16' - - B
5"-60"x14' - - C
5"-60"x16' - - D

Planer Type, Multi. Head
(Spls.dia.x Work Surf.)
4"-48"x12' 3Hds. AIA
4"-48"x16' 3Hds. B
5"-60"x14' 3Hds. C
5"-60"x16' 3Hds. D

Horiz.Bore Two Face Cylinder
6" Bar - - AJA

Jig Borers
(Work Surface)
6"x12" - - AKA
9"x33" - - B
12"x24" - - C
16"x30" - - D
22"x44" - - E
24"x24" - - F

Oil Groover
Horiz.(Bore Cap.)
5"x8" - - ALA
10"x10" - - B
Vertical
5"x7" - - C

Precision Horiz.
Single End
Table Rad Approx.
13"x22" - - AMA
1 Hd.x12"Stroke B
2 " x16" " C
3 " x12" " D
20"x25" - - E
1 Hd.x15"Stroke F
2 " x15" " G
3 " x15" " H
4 " x15" " I
36"x36" - - J
1 Hd.x Stroke K
2 " x " L
3 " x " M
4 " x " N
5 " x " O
6 " x " P
7 " x " Q
8 " x " R

Double End
14"x24" - - ANA
2 Hd.x Stroke B
4 " x " C
6 " x " D
21"x29" - - E
2 Hd.x Stroke F
4 " x " G
6 " x " H
8 " x " I
36"x36" - - J
2 Hd.x Stroke K
4 " x " L
6 " x " M
8 " x " N
10 " x " O
12 " x " P
14 " x " Q
16 " x " R

Portable Boring Bar - - - - AOA

A page from the Machine Tool Index. Every kind and type of machine is listed, with a key letter. All plants having a given machine can be found in the file at bureau coordination office upon inquiry and referred to a contractor quickly and with additional information as to the plant's available time, etc.

this factor or some other was directly responsible for the work being placed. But enough direct testimonial comment of appreciation and sufficient evidence of increased dollar volume have been voluntarily ascribed to this help to assure the bureau management that the work has been more than worth the extensive detail and long hours of painstaking effort put into it. Some large contracts and subcontracts running up into big figures have been credited to this assistance, and likewise many small shops which might otherwise have had to close up and perhaps lock the doors on their machine tool equipment have been kept busy with war subcontracts. Many large concerns, hurried for production, have been saved both priceless time and considerable investment in scarce, hard to obtain machine tools, by finding owners of such tools and subcontracting portions of their fabrication or manufacture.

From the Bureau of Power & Light's standpoint it has been the means of aiding and saving many small industrial customers whose business after the war will mean much. And when the war is over, the data contained in these files can be "sold" to assist these same local manufacturers to get back into civilian production, and thus, too, help to hold the utility's industrial load.

Most important today is that this has been and will continue to be a wartime service of inestimable value on the home front.

Smaller War Plant

Opening offices for the smaller war plant divisions in Denver and San Francisco emphasizes the War Production Board's intention to decentralize war contracting and assist a number of small businesses to survive by sharing in war production subcontracts. This is a project which the sales departments of utilities in the West will foster for the benefit of their industrial and business customers.

To further assist its program, letters were sent to the secretaries of War, Navy, the chairman of the Maritime Commission and director of treasury procurement, requesting a report by April 7 of the extent and terms upon which prime contractors with the government have let subcontracts.

Many plants in the West have been visited by representatives of the Quartermaster Corps in charge of procurement. Small plants in distress for lack of business were urged to present their problems directly to the nearest War Production Board office. Contracts are to be handled directly and distribution of war work among such distressed plants speeded up. A simple form for information requires answers to but ten questions. These are:

1. Firm name and full address.
2. Kind of business and products normally produced.
3. Kind of war work you are equipped to handle.
4. Average number of employees a year ago and now.
5. Dollar value of factory sales in 1941.
6. Dollar value of factory sales, by months, for the past six months.
7. Dollar value of business of all kinds on hand now.
8. General description of equipment.
9. Kind of war work on hand, if any, and how much.
10. If your labor force has been depleted, to what extent can it be replenished?

Emphasis was made that records get out of date in a month and if previous requests have been delayed owners of distressed plants should reapply immediately. Mailing of the information is preferred to a personal visit and will receive speedier handling.

Public Relations

That the big job for the year will be in the public relations field was told a meeting of district managers, department heads and veteran employees of the California Electric Power Co. at Riverside by President A. B. West a month ago. Presiding was A. G. Cage, vice-president and assistant general manager, who outlined the program.

West pointed out the economies in

operating costs effected by the company and declared that, while effort for increased economies will continue, the major objective for the year will be better public relations.

Other speakers were J. R. Gabbert, advertising agent, and G. C. Delvaille, executive assistant, who discussed rates. At an afternoon session D. B. Wheelock, commercial manager, handled the public relations program. C. E. Thomas, credit manager, spoke on the problem in relation to collections. Rosamond Harries, traveling cashier, told of training new cashiers. W. S. Fleming, sales manager, discussed the part servicemen must play in meeting the public and C. A. Grabendike, engineer, spoke of WPB rulings and interpretations.

Dealer Tie-in

A nationwide program designed to help its dealers maintain their identity with Frigidaire and to build goodwill, has been announced by L. A. Clark, Frigidaire's advertising and sales planning manager, coincident with the launching of national advertising carrying the theme of wartime suggestions for use of the refrigerator. The program has also been designed to cooperate with the government nutrition and conservation program, to render a real and needed service not only to the Frigidaire users but also to those of other refrigerators and to keep the name of the company before the public favorably.

A key feature of the dealer tie-in is an invitation to visit the local dealer and secure a free copy of Frigidaire's wartime suggestion booklet, which is supplied to dealers without cost. The booklet, revised and enlarged to 36 pages, contains practical suggestions on the use of the refrigerator and its proper maintenance.

Other sales aids, such as an easel display and national advertising, are offered dealers in the plan.

Utah P & L Streamlines Utilization Plan

Salesmanager tells 1943 service and advisory objectives of each of former commercial department sales divisions

REDUCED forces and gas and tire rationing have revolutionized our methods of doing business. It means fewer personal contacts with the people formerly seen by our own staff and by dealer salesmen and told the story of electrical living. However, we are determined to maintain the high level of customer good will built up during past years. Because contacts will be fewer and necessarily somewhat negative in character, they will require more diplomatic and intelligent handling than ever before.

It has been the same with manufacturers and wholesalers, whose merchandise has been eliminated or curtailed for the duration and whose salesmen do not go into the field as they used to.

To adjust to these conditions our former domestic sales group has this program before it:

1. Keep dealers informed on local conditions and changes in government regulations.
2. Assist in defense housing negotiations.
3. Work closely with dealers on improved methods of servicing customers' appliances.
4. Assist in conduct of group meetings on the economical, efficient and satisfactory use of appliances upon request of dealers.
5. Continue contacts with home economics teachers, with schools, churches and other organizations which use electric equipment in their activities.
6. Cooperate with all community programs which consider the subject of better food and nutrition health.
7. Give special help on canning and on use of substitutes, and cooperate with agencies administering rationing programs.

This part of the program is in charge of J. F. McAllister, residential sales manager, and Nancy Finch, assistant residential sales manager. Because of the shortage of new appliances, consideration is being given to the establishment of some type of exchange department, where customers may list any surplus electric equipment they may wish to sell.

Advertising, under M. L. Cummings, advertising and sales promotion manager, will have as its major objectives:

Convey information helpful to winning the war.

Maintain customer good will.

Help maintain our American system of free enterprise.

Discuss mutual wartime problems of industry.

Build a market for postwar output.

Preserve the desire for higher standards of living.

Discourage lowering of present electrical living standards beyond necessary restrictions of war.

Develop a public consciousness of the necessity of proper care and use of domestic electric appliances and commercial and industrial electric equipment.

We will carry a variety of themes in our ads this year, featuring electric cooking and electric refrigeration with the nutrition theme, which is becoming increasingly important due to the food situation; importance and value of good lighting in protecting eyesight and increasing war production and efficiency of war workers; helpful information and definite suggestions for keeping electric appliances and equipment in good condition; situation regarding electric service connections and requirements which must be met in purchasing and installing electric ranges; and the availability and low cost of our service for its many uses in the home. Practically all of our ads will carry a spot urging the public to invest in war bonds. Complete ads will be used to point out how the purchase of these bonds can be the means of acquiring electric kitchens and electric servants when the war is over.

Commercial sales plans, under J. H. Shaw, commercial sales manager, will be those of assisting this type of customer to get the most efficient use from their existing equipment. We now have available in each office a list of idle electrical equipment. Occasion may arise where a dealer or contractor may need some of this equipment. We invite them to avail themselves of this opportunity to help meet the shortage of equipment. Any sales so made will be consummated between the parties involved.

Preventive maintenance for industrial customers will be the province of G. B. Walker, industrial sales manager. One of the biggest jobs to be done in wartime is to keep industrial electrical equipment in use.—*W. A. Huckins, general sales manager.*

Care and use information displayed on cards at UP&L Preston salesfloor

Care of Commercial Cooking Equipment

Diagnosis of common troubles and what to do to eliminate them; make heavy-duty equipment last

BECAUSE electric equipment for cooking, baking and food preparation in restaurants, hotels, schools, hospitals and now in Navy and Army camps and posts has received a higher percentage of saturation in the West than elsewhere, and because materials restrictions limit replacements, it is important that care and service to such commercial cooking equipment be given. Such care and maintenance will prolong the life of the equipment, reduce the need for repair parts and replacements that may be difficult or slow to get, and give better results in food preparation as well.

To obtain continuous, uninterrupted and satisfactory operation of such heavy-duty electric equipment as bake ovens, fry kettles, griddles and ranges there should be:

1. Correct installation, assembly of equipment, location of equipment, proper line connections in respect to phase and voltage according to wiring diagrams and instructions usually furnished.
2. Knowledge of the use and operation of the equipment.
3. Routine cleaning and inspection regularly as a means of preventing conditions that lead to damage.
4. An ability to diagnose conditions and apply the right corrective adjustment or make repairs.

Fortunately few conditions arise which require either mechanical or electrical repairs, for often a change in installation, operation, or minor adjustment is sufficient. The accompanying chart provides a quick check method of diagnosing such conditions and tells what to do about them.

Temperature Control

Automatic electric control is one of the chief attributes of electric cooking equipment. Temperature control by thermostat at predetermined settings therefore is important.

Two general types of control are used by various manufacturers. One employs a hellical coil or bimetallic blade that expands or contracts as temperature changes. This change of position moves the contacts to close them or open them as required. A more recent type is hydraulically actuated. A bulb filled with liquid, which on heating or cooling expands or contracts, exerts pressure on a blade to open or close the contacts.

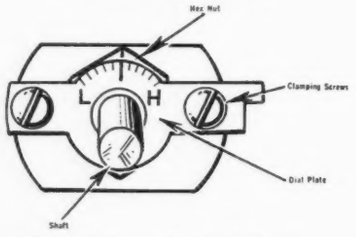
Helix-type controls are adjusted by means of a set-screw that works against the temperature indicating pointer.

Bulb-type controls require a careful procedure. But before anything is touched, it is far better to check the temperature accurately. Nothing will be accomplished by making adjustments that attempt to compensate for external sources of trouble, such as draughts, overloading the oven, or other conditions that are not normal to general use of the equipment. To adjust to an abnormal or temporary condition only means to throw the equipment out of adjustment to normal conditions.

First it is absolutely necessary to use a reliable and accurate means of checking the temperature. Best is to use a thermocouple with a milivoltmeter or similar instrument. Next best is a good mercury thermometer designed to operate at high temperatures.

Next, when checking temperatures, be sure that the oven, grid surface or frying fat being tested is thoroughly preheated and then proceed as follows:

Procedure for Raising or Lowering Oven Temperature to Agree with Dial Knob Setting



Control with Screw-On Dial Knob

1. Remove dial knob (pull out and turn left to unscrew from shaft).
2. Loosen two clamping screws on shaft dial plate.
3. Hold hex nut (back of dial plate) stationary and turn shaft and dial plate left to raise temperature and right to lower temperature.
4. Tighten clamping screws and replace dial knob.

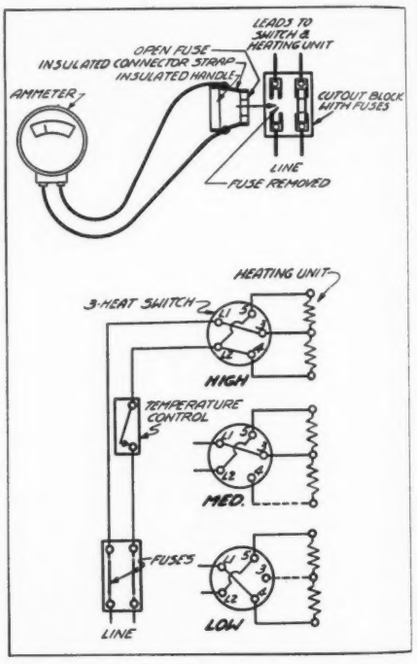
Adjusting Control with Push-On Dial Knob

1. Remove dial knob (pull off).
2. Loosen plate on back of knob.
3. Reset plate toward RAISE or LOWER.
4. Tighten plate to knob and replace knob.

Note: Each division marked on the shaft dial plate or dial knob indicates approximately 10 degree F. change.

Ovens

1. Suspend thermocouple or place thermometer approximately in the center of the oven.
2. Set control dial at 400 and thoroughly preheat the oven at that setting, keeping door and damper closed.
3. Then switch off and allow to idle for 10 minutes.
4. At the end of 10 minutes turn dial to the left until contacts snap closed. An audible click indicates the closing or opening of the contacts within the control.
5. Note the dial reading and turn dial to the right to open the contacts. The average dial reading between the closed and open contact positions indicates the control temperature setting.



Diagrams show: (top) convenient unit circuit analyzer; (bottom) a typical three-heat switch and unit circuit

6. Check the *actual* oven temperature as shown on the thermocouple reading or thermometer. Compare this with the average control dial value.
7. If the two vary, adjust the temperature control (as shown in the accompanying figure), to agree with the actual temperature.

Fry Kettles

1. Preheat the fat to 375° F. dial setting on the control.
2. Place temperature recording device, thermocouple or thermometer, at the center of the fat container and 2½ in. below the fat surface.
3. Proceed as with the oven; switch off and allow to idle, at end of which turn dial to left and right until contacts snap open and closed. Check

the average between the two with the actual temperature indicated on the thermometer or thermocouple.

Griddles

1. Place thermocouple bulb in a globule of solder or the thermometer bulb covered with fine sand at the center of the grid surface.
2. Preheat to 400° F. dial setting on the control, and
3. Check as with the oven (above).

To Make Repairs

A knowledge of construction details is important to the location of a source of trouble. The means to accomplish the repair usually is obvious once the trouble is segregated.

In locating electrical trouble, it is wise to know the wiring arrangement for obtaining the three heat positions on each unit. The unit, as used in this discussion, refers to the assembly or part that supplies the heat, whether in an oven, griddle, range or fry kettle. A three-heat switch is used to provide control of the three heats, *High, Medium* and *Low*.

Each unit has two separate coils or elements, both having the same voltage and wattage rating. On *High* both coils or elements of the unit are switched in parallel across the line, thereby using full unit wattage. On *Medium* one coil is across the line, thus using but half the wattage. On *Low* both coils are switched in series across the line, and use but a quarter of the total unit wattage.

First thing to check is to be sure that the unit is operating at its proper rated voltage. To do this, place an ammeter in series with the unit circuit, as shown in the diagram accompanying, and turn the switch through its three heat positions. The indicated ampere values should follow the same relation as that just stated for each of the three positions—full rating on *High*, half rating on *Medium* and quarter rating on *Low*.

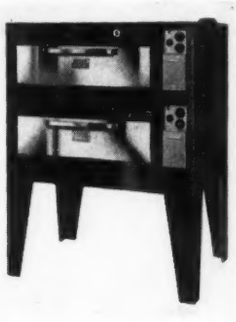
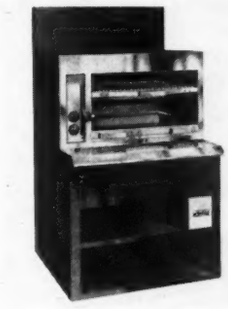
On bake or roast oven units this check is particularly necessary because the units for such equipment are made up of a number of coils or elements wired together in series and parallel to achieve the same effect as smaller units having but two coils.

Loose connections are to be watched for. These may occur where leads are connected to terminals. Fuse clips that have oxydized also cause poor connection. All connections need to be inspected periodically and tightened when found loose, or cleaned when oxydized.

Underfusing may cause frequent fuse burnouts. On the other hand since much of the heat at a fuse may be caused by minute arcing between the fuse ferrules and the fuse clips

TROUBLE SHOOTING CHART

Note: Assuming proper line voltage for equipment rating and no apparent inoperative or malfunctioning parts.

REPORTED OR OBSERVED	CAUSES
OVENS	
Uneven browning of products from front to back.	Decks or baking surface not level.
	Flue directly connected to outside stack or exhaust system (drawing out heat).
	Draught from open window or fan blowing into oven.
	Damper open too far.
	Top unit too far back (pull forward).
	Frequent opening of door.
	Burned-on accumulation around door opening and bottom, preventing door from closing.
	Door balance requires adjusting.
Uneven top and bottom color.	Insufficient pre-heating.
	Unbalanced switch settings for top and bottom.
Spotty bottom color.	Uneven pan bottoms.
	Mixed light and dark pans.
	Burnt spillage accumulation on deck.
Under or over baked products	Temperature setting too low or high.
	Too short or long time allotment.
Steaming around door.	Damper not cracked sufficiently to permit steam to pass through flue.
FRY KETTLES	
Smoking of fat.	Old fat, no fresh replacement added. Requires straining.
	Fat level below unit level.
Over-soaked products.	Too low temperature.
	Over-loading of basket—too large quantities at one time.
	Products too wet.
	Fat deteriorated or dirty. Requires straining and fresh fat additions daily.
	RANGES, BROILERS, GRIDDLES
	
Surface hotplates buckled or not level.	Carbonized accumulation between plates and at ends.
Food sticking to griddle surface.	Grid not properly seasoned requires cleaning and reseasoning.
Uneven grid temperature.	Check for draught or fan blowing over surface.
Broiler smokes.	Accumulation on grid or drip pan.

due to oxydation or corrosion at the fuse clips, such heat may build up to a point where it will melt the fuse even though the circuit amperage is correct. Fuse clips will lose their temper and loosen when subjected to slow heat. When loose the contact is poor and local heating may result. Continued heating at such a place may even cause the ultimate failure of the cutout block. It is well to check fuse and fuse clips periodically and keep the contacts clean and tight.

Burning off of terminals of the heating units themselves will render them unusable, whether the circuit of the unit itself is intact or not. Loose or burned spring contact connections will cause such burning off of terminals. It is good maintenance to brighten up terminal connections or clips when necessary and always before installing new leads.

Do not discard a unit as worthless until an attempt, at least, has been made to restore it to service by some kind of a terminal connection repair. In many cases an improvised connection that is tight will save it. Manufacturers are no longer able to furnish all the parts and replacements wanted immediately. Therefore, all ingenuity to make repairs that will last should be exercised.

Combine a knowledge of the equipment with resourcefulness and ingenuity to diagnose trouble and then to repair it. Tracking down the cause of the trouble usually suggests a remedy for it. But unless the fault is corrected permanently through careful and satisfactory repairs or, as a last resort, replacements, the job will only have to be done over again and possibly with less chance of success. Any fault caught soon enough through regular inspection of equipment or prevented through reasonable care and cleaning may be the means of saving the equipment for continued service and usage instead of causing a possible abandonment altogether.

Although this advice has been prepared with the assistance of the Hotpoint-Edison General Electric Appliance Co., Inc., the procedure suggested will apply with only slight mechanical modifications to heavy-duty equipment of any make. That company, like all makers of commercial cooking equipment, has available instruction books to assist in the care and maintenance of its apparatus. The Hotpoint booklet for this purpose is titled, *How to Make the Most of Your Hotpoint-Edison Electric Kitchen*, which also goes into operating management suggestions to make the most economical and trouble-free use of the entire range of restaurant electric equipment.

Groups Merge for Wartime Operation

Merger of Pacific Radio Institute with electrical bureau completes economy centralization program

MERGER of the Pacific Radio Institute with the Northern California Electrical Bureau completes the wartime economy centralization which began last August when the Electric Appliance Society of Northern California officially joined the bureau. Operating under the bureau name the merged group will continue the activities formerly performed under the jurisdiction of the three separate organizations. This will be accomplished by having five sections—lighting, wiring, appliances, radio and education—headed respectively by Edward J. Duggan, H. J. Newton, B. M. Tassie, A. E. Rowe and George C. Tenney.

Local units will function as before, merely changing the name from Electric Appliance Society to that of the bureau, and expand to represent the five sections of activity. Headquarters remain at the Western Furniture Exchange and Merchandise Mart, San Francisco.

The merged organizations now operate with a board of directors with wide representation from each branch of the industry, an executive committee of nine, five of whom head the sections of activity. In addition to the five named above on the executive committee are Charles W. Goodwin, Jr., George W. Abbett, A. H. Meyer and B. W. Reynolds, chairman. Officers of the bureau are: Louis J. Breuner, president, Charles W. Goodwin, Jr., vice-president, A. E. Rowe, treasurer, O. R. Doerr, secretary, and B. W. Reynolds, chairman of the executive committee.

There were some definite programs undertaken during the year 1942, particularly with respect to lighting and its relation to merchandising. Under the direction of Clark Baker, a series of lectures on lighting and its effect on home furnishings was given to retail salespeople of various stores in Sacramento, Stockton, Oakland and San Francisco. One large San Francisco store was influenced to remodel its entire lighting sales floor, and utilized Baker's services as a consultant in connection with the change.

Various phases of commercial lighting were presented to different groups at the Samuel Gompers trade school in San Francisco—a continuation of the work which was started many years ago. Additional lighting lectures were given to Red Cross centers and to service clubs throughout the area, and to miscellaneous groups wherever the occasion arose.

In cooperation with the Sight Conservation Council, a new set of school classroom lighting recommendations for 1943 was prepared. The preparation and delivery of a series of lectures at the San Francisco State Teachers' College summer session served to emphasize and advance this important project.

When the Pacific Gas and Electric Co. launched its industry "Durationize" repair service program, the bureau immediately cooperated. When a serious shortage of trained servicemen threatened to have a detrimental effect on the program, the bureau sponsored a servicemen's training program through the vocational departments of the public school systems. Classes were started in San Francisco, Oakland, Sacramento and Fresno, and more than 40 trainees were "graduated" into jobs in dealers' stores. These courses were open to men not eligible for draft and to women, with no previous experience required.

Another constructive step taken in 1942 was the inauguration of the dealer counselor service, to provide confidential advice to dealers overwhelmed with wartime problems.

What of 1943? The bureau will, of course, continue to act in an advisory capacity to disseminate pertinent information and to hold meetings where necessary to discuss constantly arising new problems which will have to be faced. Some of the activities carried on last year by the lighting counselors will be curtailed, insofar as educational work is concerned especially. Continued educational work with retail store lighting salesmen and cooperation with the Sight Conservation Council, however, offer good possibilities for a continued activity which will lay the foundation for an enlarged program after the war is over.

The Durationize program will be continuous and probably stimulated as need for trained servicemen becomes more acute, due to increased demand for manpower in the war effort.

The original training schools will be continued and supplemented with at least two more—one in San Jose and one in Stockton. Undoubtedly, there will be other problems arising which will require a solution or at least action.

War Regulations

Important revisions promise smoother operation, more speed

ADJUSTMENTS to a number of price ceilings, priority orders and limitation orders were made during the past month, several of them affecting the various branches of the electrical industry. Such changes, sifted and briefed, are reported here more as an index of such changes for those affected that they may obtain more complete information than any attempt at completeness.

Refrigerator ceiling prices for used machines were adjusted to permit $5 more on one-year guarantee boxes of 1939 and younger, and $10 on 1938 and older, with the present one-year guarantee price allowed on 90-day guarantee jobs. There is also discussion and a survey going on to release more of the large stock of frozen new models about April 15. Form PD-427 still must be used to obtain release of these for war housing. A revision of MPR 139 effective April 15 enjoins the householder and even an auctioneer from selling used refrigerators above ceiling prices.

Electric ranges now require PD-556 to obtain from manufacturers and distributors stocks. Manufacture was stopped entirely but dealer stocks can be sold as before. Procurement of repair parts requires turn-in of old parts for salvage. Only parts to be manufactured are heating units, thermostats, switches, relays, lead-in wires, handles and hinges. The victory model replacement heating unit is made to be interchangeable with most ranges.

Radio parts too are being further simplified before manufacture of victory parts within a month. Used parts must be turned in, for servicemen will obtain new parts only on turning in old. Meanwhile OPA has warned dealers not to refuse to sell tubes except when doing a service job on a radio.

Electric heaters now have a dollars and cents ceiling set by OPA because Eastern fuel shortages caused a run on bowl-type reflector heaters and a hiking of prices.

Fluorescent lighting ballasts and transformers may be required turned in when replacements are bought in the near future. The move is to recover much usable critical material. Standardization of ballasts and ballast leads to reduce wire losses during assembly is also being worked on.

Fans and blowers were placed under a Limitation Order L-280 and require an AA-5 or higher for purchase. Wall and ceiling desk fans are not included but have not been manufactured.

Farmers can use new or rebuilt electric storage batteries of the automotive type for electric fences, under an amendment to L-180. Originally such batteries were permitted only for autos.

Construction and Housing

Contractors were jubilant to learn that the onerous requirements for the filing of a report of costs before and after each job of $500, as required by MPR 251, were rescinded by Amendment 1, effective Mar. 22. The entire MPR 251 was not withdrawn as at first supposed, but only the filing requirements. The balance of the price regulation, even the certificate of compliance, remains in force.

PD-1 application forms were simplified and beginning Mar. 15 began to be processed at the regional WPB offices at San Francisco and Denver for applications requiring $100 or less of materials. Hawaii had its military restrictions lifted so that its priority matters can now be handled in San Francisco too. As time goes on it is expected that more and more will be handled out of district field offices and regional offices to expedite matters. All applications for priorities now go to the district offices for review and transmission.

Regional offices are empowered to authorize construction under L-41 and assign preference ratings to building operations costing less than $10,000, except industrial and other listed types of building. Publically financed housing projects are not affected. They, like industrial and other special construction, will continue to be processed in New York. Utility connections for construction or remodeling projects may now be granted from regional offices under supplemental utilities order U-l-d. Automatic approval is granted where material runs less than $1,500 for underground or $500 for overhead. Not more than 60 lb. of copper may be used in connecting an industrial or commercial consumer.

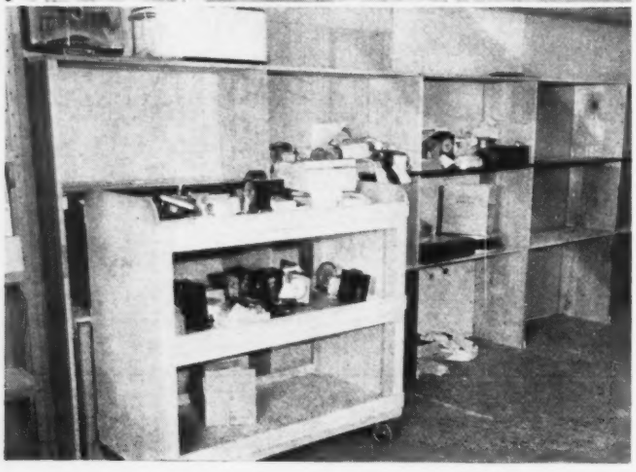
Wire restrictions under CMP-4 were revised to permit the shipment of a full reel of cable in sizes 4/0 or larger in full reels not exceeding 1,000 ft. Previously the 500 lb. limit would have made it necessary to cut off portions of a reel in excess of 500 lb.

April began the first quarter of the Controlled Materials Plan.

CONDUIT LIMITATION ORDER L-225
(Summarized)

Product	Installation Restrictions Applying to All "Electricians"
Rigid electrical conduit (heavy wall), sizes 1/4 in to 27 in.	May be installed only to protect wires and cables for necessary flexible extensions less than 12 ft. in length.
Rigid electrical conduit (heavy wall), sizes 2 1/2 in. to 6 in.	May be installed only: (a) in Class I, II, III, and IV hazardous locations; or (b) to protect wires and cables from mechanical injury; or (c) in damp and wet locations as defined in Article 100 of the National Electrical Code.
Electrical metallic tubing (thin wall), sizes 3/8 in. to 2 in.	May be installed only to protect wires and cables: (a) From mechanical injury in the wiring to machinery or production equipment; or (b) Embedded in concrete or masonry walls; or (c) In elevator hoistways; or (d) In damp or wet locations as defined in Article 100 of the National Electrical Code.
Flexible metal conduit, sizes 5/16 in. to 3 in.	May be installed only in Class I, II, III and IV hazardous locations as defined in 1940 National Electrical Code.
All other metal raceways and wiring enclosures.	None

PRIORITY RATING required to purchase or install—A-1-J.
Does **not** affect **used** conduits or conduits in the possession of any electrician on Dec. 16, 1942.
For further interpretation and definitions, consult complete Order L-225. Write your nearest WPB office for a copy.



Repair Service is 75% Detail

Procedure to trace appliance from its entry to delivery expedites service, reduces cost

IT'S 75% detail and 25% mechanical, says Clyde L. Chamblin, best known as a San Francisco electrical contractor, who with his son now operates two of the most up-to-date and efficient electric appliance and clock repair service stations in Los Angeles and San Francisco. Nor does Chamblin make any bones about the fact that he is learning the repair service business from his son, Keith, who pioneered the California Electric Service Station at Los Angeles and developed the procedure. When the repair business grew so large that it crowded him out of his 639 Mission St. place, Clyde Chamblin moved his expanding service business as well as his contracting business, California Electric Construction Co., to much larger quarters at 400 Mission St. In doing so it was necessary to develop a complete detail procedure to expedite the repair work, keep track of each of the hundreds of individual clocks and appliances that come in each week, and to bill and collect for services rendered within the OPA ceilings and still come out in the black.

While the shop layout and facilities were important to render the mechanical part of the process efficient, the accounting system likewise had to be simple so as not to be costly, yet detailed enough to keep tab on every step of the repair job. Both mail orders from other dealers and appliances brought in person by their owners had to be handled. With present-day delays in receipt of parts, writing and useless call backs had to be minimized. Parts business, too, had to be coordinated in the plan. Flow of work through the shop likewise had to be organized.

Accompanying photographs illustrate shop facilities such as working areas, benches, tools and bins. A brief description of the system developed may do for other

Pictured, top left and around; service manager Henry Stovesky, Clyde Chamblin, and shop superintendent Charles Sephton. Appliances received at counter are tagged and registered. Those received at shipping room, are also and each day's total placed in a separate bin at the rear with day's register sheet. Next below are finished appliances brought to the billing desk for writeup. Shipments are packaged from adjacent shipping room, or wrapped for "will call." Note the three-deck cart on castors used to carry each day's work. Lower picture shows cart at some of the bins for each day's assignment. Not shown is a large stockroom containing thousands of repair parts

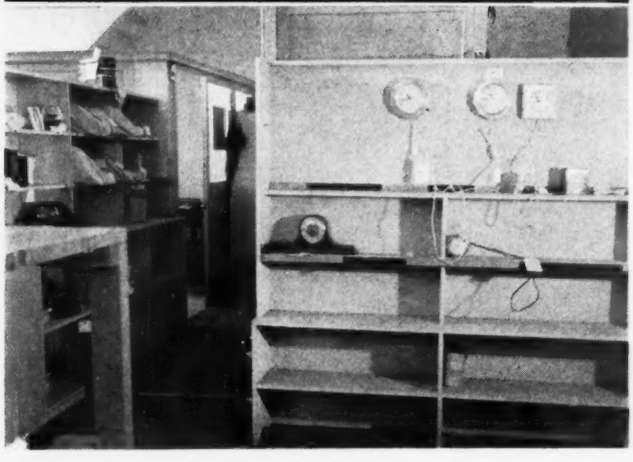
repair service shops what Chamblin says he wishes someone could have told him to do before he embarked.

Packages delivered at the front door by postmen are taken to the rear shipping room, unpacked and checked against an alphabetical file folder containing all prior correspondence or notification of shipments. Individual owners of clocks or appliances bring them to the front reception counter. In either event the incoming appliance is registered on a dated ledger sheet in duplicate, with name and address of its owner or dealer sending it in, description of the appliance and instructions. It is likewise given a numbered tag. This tag, in three sections, is tied to the appliance, the middle section kept with it until the appliance is assigned to a workman, and the claim check portion given the customer or held with his mail order. When the appliance is assigned to a workman by the shop superintendent, the middle section goes to the counter to be filed alphabetically. If inquiry is made of that appliance it can then be traced quickly for the customer.

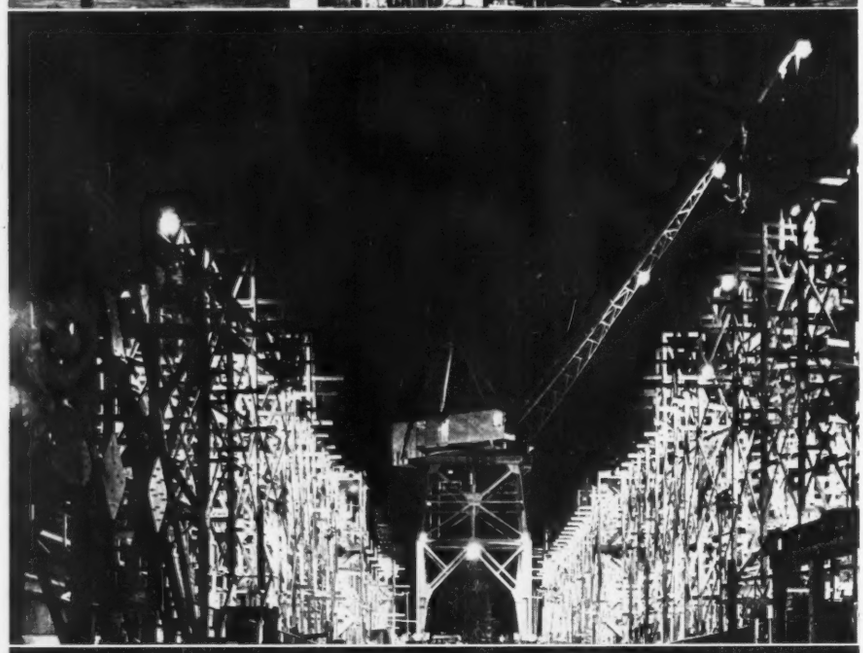
The string section of the tag remains with the repaired appliance until called for or shipped, then is filed numerically for future reference. On the back of the tag the workman enters what work he performed and the parts used. This tag is used later to bill the job. The tag number is also scratched on the clock works or appliance so that any future claim as to service promised can be checked back against the work tag.

Each day's clocks and appliances are loaded on a portable cart and deposited in a section of bin, together with the register ledger sheets for that day. From these bins Shop Superintendent Charles Sephton assigns a day's work to each workman. When repaired and tested, the appliances are "written up" on an autographic register which makes three copies, the original serving as an invoice or bill, the second is filed at the counter alphabetically for quick reference, the third in the office numerically. Pricing on this form is done from a standard price chart so as to be consistent and fair.

Near the counter finished appliances, clocks or trains are put in bins alphabetically. There are also bins for those held pending order to proceed after a quotation and for those held awaiting parts. Thus the entire procedure is kept under control.



Below is the Los Angeles shop. Keith Chamblin at left center. Top to bottom: one of the several clock repair benches. A day's work for each man is placed in the rack behind him. Next is the appliance repair bench, and below that the Lionel train repair shop. At bottom the clock test bench and "will call" bins at the left



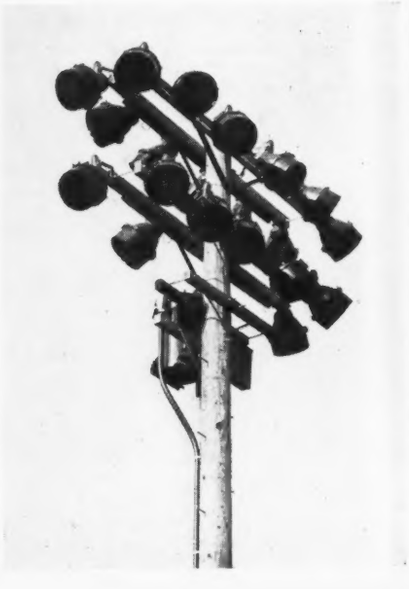
Shipyard Light

Dimout provided by control of direction at Marinship

Confronted with the need to furnish sufficient light for continuous shipbuilding which would conform with the dimout restrictions of the bay region, the electrical engineers at the Marinship yard in Sausalito met the requirements in a way to earn the reputation of "best dimmed out shipyard in the country." It meant complete adjustment of the outdoor lighting system, painting of hundreds of reflectors, installation of louvers, erection of higher poles and aiming of units.

The job involved about 800 floodlighting units on poles and structures, ranging from three on a pole to 35 on a building. Approximately 150 street lights are controlled by General Electric photo-electric cell. Some 250 luminaires had to be painted and correctly positioned; almost 100 others had to be replaced. Another group of more than 400 open-type 1,500-watt units, used for portable and temporary purposes, was also painted and readjusted. Approximately 1,000 lensed-floodlight 1,500-watt units are included in the permanent yard installation. Note the sharp cut-off in the accompanying photos, the louvers in others.

Mounted on 660-ft. wood poles, the average flood bank comprises eleven units on two crossarms. Some poles have as many as 20 units, all equipped with Aladdin louvers. Night welding mostly is done under roof. Outdoor skids were equipped with rolling shed-like structures which both conceal welding flashes and protect against rain. Daytime they are wheeled away on rails.



EMEA *Dope Sheet*

Find Motor Load by Ammeter Readings

Joseph A. Setter
Industrial Department
General Electric Co., Denver

IT is a well-known fact that underloaded induction motors operate at very poor power factor and draw an excessive amount of lagging current. This in turn wastes vitally needed power in all feeders and in distribution equipment clear back to the generating station power. With the war production program, many machines and factories are now working continuously. Some machines are being loaded with heavier production schedules than they were originally designed for, while others are underloaded. Demands for new machinery have sometimes led to the installation of used equipment, in many cases overmotored in relation to the immediate job.

Frequently these difficulties can be overcome by checking the load and, on the basis of such a check, switching motors on some of the machines to improve the load factor. A simple method can be used whereby loading on integral-horsepower induction motors can be determined with practical accuracy by means of a hook-on volt-ammeter.

This method is of unknown origin but has been used with practical results by several plant electricians for a number of years, and has been checked for accuracy with design data of motors. With this method it is not necessary to lose productive time, because the leads to the motor need not be disconnected to make the tests.

Here are the seven simple steps to be taken in using this method:

1. Plot a chart with "per cent horsepower" against "per cent full-load amperes" for each motor.
2. Locate point A as 100% from motor name-plate reading of amperes at rated horsepower of motor. (Also it is assumed that the name-plate voltage is maintained.)
3. Disconnect motor from load and read no-load amperes with ammeter and locate point C in per cent of full-load current (approximately 25 to 45% depending on speed of motor).
4. Locate point D halfway between O and C and draw line DA.
5. Locate point B on line DA at 50% of the motor horsepower rating and draw CB.
6. Then line ABC will be the approximate curve of the per cent horsepower output of the motor plotted against per cent of motor current.
7. For any motor current, read in amperes, calculate the percentage of the full-load current, follow horizontally until line ABC is intersected. Then drop down vertically and read the per cent load of the rated horsepower of the motor.

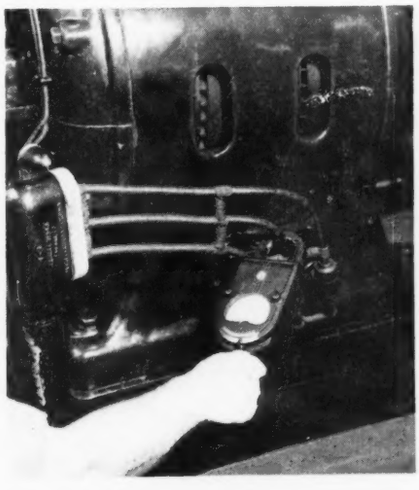
If it is not convenient or feasible to disconnect the motor from the load as suggested in Step 3, then the no-load current can be taken from Fig. 1. For example, an 1,800-rpm. motor has a no-load current of approximately 25% which is the average for motors up to 100 hp. Lower speed motors have higher no-load currents, in the order of 45% of full-load current for 600-rpm. motors.

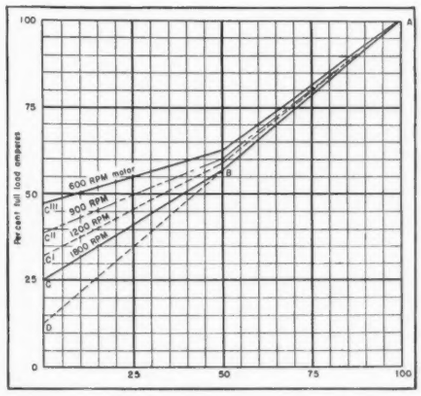
It may be surprising to find that the no-load currents are as high as that shown in Fig. 1, but it should be remembered that the no-load current is nearly all magnetizing current at practically zero lagging power factor and that the actual horsepower input from the power system is very low. This accounts for the rather high currents below one-half load where the efficiency of the motor is also lower.

From one-half to full load, it can be seen that the motor current is roughly proportional to horsepower output because both efficiency and power factor are higher and more nearly constant.

Above full load, the current continues to increase in direct proportion to the load up to 125% of full load.

Hook-on volt-ammeter used to measure motor current to compute hp. loading





Curve for estimating hp. output of a motor at any load from hook-on volt-ammeter readings. Accuracy 2 to 3%

This can be useful as a guide in carrying out wartime recommendations on increased motor loadings.

This is a timely, practical, and time-saving way to determine the horsepower that an a-c motor is delivering just from an ammeter reading. Accuracy of between two and three per cent can be expected, subject of course to the ammeter accuracy tolerance.

Another advantage to be obtained by the hook-on volt-ammeter is that the voltage applied to the motor can be read simultaneously with the current. It is obvious that a motor must have the proper voltage applied or the current will be too high and overheating will result. This will also give an indication of the loads on feeder copper so that remedies can be applied.

Such a method will serve as an additional tool to help in the war program of utilizing all materials to the best advantage. Proper motoring is a patriotic necessity to conserve vital materials. Overmotoring is a tacit admission of insufficient knowledge of the machine and during wartime it is almost a crime. Any error should be made on the side of reasonable overloading to get maximum use of the motor horsepower available.

● WOMEN ELECTRICAL MECHANICS are being trained in Seattle, according to Marshall Goodwin, director of war production training for Seattle schools. Classes for women of ages between 20 and 45 as electrical mechanics and electricians' helpers are being conducted at Edison Vocational School. Course is given without cost, four nights each week, four hours per night for six weeks. Demand for trainees in the shipyards is great.

Fluorescent

The Need

Precision workmanship on parts requiring minute accuracy demands excellent seeing conditions. Important detail work done in drafting rooms requires close visual effort.

Drafting Room

Installation of 137 40-watt fluorescent lamps in six continuous rows, each 98 ft. long, in area 98 x 28 ft. furnished 50 ft.-candles of illumination. Lamps are mounted on metal troughing which contains auxiliaries.

LIGHT for a STEEL PLANT

Who

Consolidated Steel Corp., Ltd., Maywood, Calif. (recently awarded Navy "E" pennant). Lighting system designed under the direction of Ray De Camp, head of the mechanical department; H. G. Landstrom, electrical engineer, and E. L. Christopher, assistant electrical engineer. Electrical contractors were Commercial Electric Co. and Consolidated Steel.

Mercury Vapor

Machine Shops

In the heavy machine shop, an 800-ft. long building, housing heavy machine shop, sub-assembly and final assembly, 372 400-watt mercury vapor lamps in high bay units are spaced on 12-ft. x 12½-ft. centers, 38 ft. mounting height, giving an average intensity of 50 fc. Lamp voltage is from 138 to 140 volts.

Welding Shop

Light machine shop lighting consists of 208 400-watt mercury vapor lamps in high bay units on 12½-ft. x 13-ft. 5-in. centers, mounted 32 ft. from the floor.

Welding shop lighting is accomplished with 99 400-watt mercury vapor lamps spaced 12½-ft. x 17-ft. 9½-in. centers, 32 ft. from the floor. This was designed for 30 fc.

Chick Brooder

Unit designed for backyard poultrymen

A BROODER which should prove useful to "backyard" poultrymen has been designed by Thor W. Christenson, of Pacific Gas and Electric Co., as another of the company's wartime aids to its customers. Christenson's home dehydrator was described by ELECTRICAL WEST in March.

Basis of these wartime designs is simple and flexible construction requiring a minimum of critical materials. Christenson has tried to use materials which can be found on the majority of farms and in many city basements.

Designed for 25 chicks, the brooder is 19 x 19 in. x 14 in. high. It consists of four legs and a reinforcing side panel six inches wide. Shelf oilcloth, lightweight canvas or similar material serves as a curtain.

Two ordinary sockets in parallel fitted with 60-watt lamps comprise the heating unit for the 25-chick brooder. Lamps are placed approximately eight inches apart and should be at least three inches away from reflectors. Coffee can lids make good reflectors, Christenson says, or some other material can be used.

No thermostatic temperature control is provided in the design because materials are not available. To compensate, the unit is larger than similar devices and lights are placed on the side rather than on top of the box, so that the chicks can adjust to temperature changes by crowding close to or moving away from the lamps. Thirteen square inches per chick has been allowed by Christenson as against seven square inches per chick generally recommended by universities and experiment stations.

In cold climates, it is suggested that the brooder be placed against a wall for greater warmth. Lamp sizes should be varied according to conditions to insure that the temperature underneath the lamps does not run above 80°.

Two lamps are recommended to guard against failure, since, if one burns out, the other will provide sufficient heat until a replacement can be made.

The same design can be made to accommodate a greater number of chicks by increasing the size of the box and using larger lamps. In larger brooders, it is sometimes advisable to use three lamps, Christenson says.

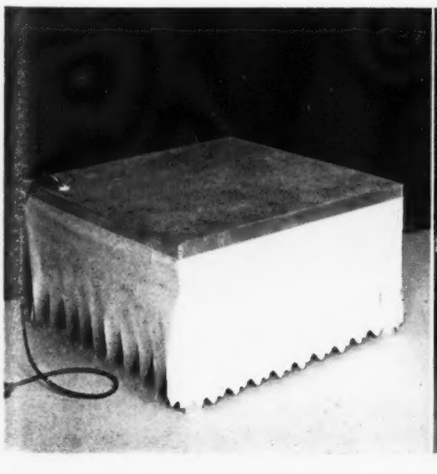
Farm Institutes

Sectional meetings stress care of equipment

PREVENTIVE maintenance of farm electrical equipment was taken to the farmers in a series of three-day meetings conducted at Davis, Fresno and Los Angeles by members of the University of California and the Committee on the Relation of Electricity to Agriculture.

These institutes were designed to bring to them a group of people who in turn would act as advisors and guides and counselors to farmers in the better care of their existing electrical equipment to make it last the duration if possible. Among these were utility farm advisors, farm advisors for the various counties and members of their staffs, Railroad Commission representatives, representatives of pump companies, motor and control manufacturers and distributors, dairy equipment, farm and equipment dealers. They were given the preliminary instruction with the idea that in turn they would carry it to farm groups throughout the state.

A minimum of critical materials is required for this 25-chick brooder



Instructors on the program under Ben D. Moses included J. P. Fairbank, J. R. Tavernetti and Rene Guillou. J. Duell, representing the Farm Bureau Federation, also participated, and local chairmen were A. M. Frost, Pacific Gas and Electric Co., San Francisco, at Davis; E. G. Stahl, Pacific Gas and Electric Co., Fresno; and George N. Hawley, Southern California Edison Co., Los Angeles.

How to present to farm group meetings the information available was the topic with which Fairbank opened the meeting. He discussed the films, movies, charts and other exhibit material available and advised on the organization of this material to present to farmers.

Demonstrations of the right and wrong ways to make splices, to install knob and tube wiring, to repair cords and sockets; the proper types of sockets to use in various places; trouble shooting; and proper sizes of wire were among the things pointed out by Tavernetti under the general topic of Farm Wiring.

Ben Moses discussed the single-phase motor in the smaller sizes with maintenance hints for longer life and better operation and advised that, on the larger irrigation motors, qualified repair men be employed to make necessary repairs or adjustments. He also talked on the quarter-horsepower and similar motors used on small machines.

Heating elements, thermostats and other similar equipment used in brooders and incubators were covered by Guillou. He touched upon simple repairs to elements, change of elements, adjustment of bimetallic thermostats, proper care of immersion-type heating elements, removal of scale, operation of low-water alarms and general cleaning procedure for sterilizers, feed grinders and other equipment. In all cases the information and material were presented from the standpoint of practicality and horse-sense. It was what the farmer should be told about his equipment and wiring.

The over-all plan was discussed by Duell, of the Farm Bureau Federation, who told of its origin with the U.S.D.A. War Board and its importance in the production of food for victory. He also told that repair part manufacture might be increased but new machinery would be almost impossible to obtain.

The entire program was carried on in cooperation with the C.R.E.A., the power companies, Farm Bureau Federation, county farm advisors, extension service of the University of California in addition to a group of manufacturers. Follow-up meetings are being held now by farmer groups.

ELECTRICAL WEST

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A Poor Excuse

"IT'S the war." One hears the remark on every hand. An excuse for a breakdown of service. An alibi for lack of courtesy. Justification for failure to observe the ordinary rules of good conduct. Whitewash for a kind of creeping paralysis that affects tempers, dulls consciences and destroys tact. Supervisors use it for an excuse for failure to discipline workers. Executives exculpate untrained workers with a shrug and the statement, "The war, you know."

Thus far the general breakdown of what has been good public service has not yet hit the electric utilities. The railroads show evidence of it. A ticket clerk slams a window in the faces of a long line of waiting people. Green help on trains show lack of tact. Overworked oldsters let tempers get out of hand. Other businesses suffer too. And it is unfortunate. For if business can maintain the service, the courtesy, the personality which it has demonstrated for so many years, in the face of today's trials and emergencies, it cannot help but win everlasting goodwill. Reason is that government is providing just the opposite in the case of the many agencies with which the public must deal. Contrast the courtesy and understanding a customer normally receives from a well trained utility clerk with that received from a ration board clerk. Or from employees or volunteers of many of the various and sundry agencies which govern the public's daily life. Here the attitude is more likely to be punitive rather than helpful. Usually it stems from that truism that a little power makes a man a self-appointed dictator.

So as a vivid contrast to the treatment received from governmental bureaus and bureaucrats, let business, and particularly the utilities, maintain the friendly courtesy and spirit of helpfulness that has marked past dealings with the public. It will pay off some day when votes are counted.

Controlled Manpower Plan

MATERIALS do not go on strike, walk out, or go absent, it is true, but something like the Controlled Materials Plan needs to be devised for manpower before long. Otherwise the maze of contesting priorities for men will result in as constipated a mess as the battle of priorities over materials between the various war departments and agencies developed into before the allotment system of CMP was substituted.

With definite allotment of total available materials to the respective war production and essential civilian supply fields, there is some hope that the materials log jam may be controlled and handled. Decentralization of WPB procedure to give closer local autonomy to the obtaining of necessary materials will expedite this phase of the war program.

But the labor and manpower situation still is too much influenced by politics and labor officialdom pressure to hope for such an early smoothing out. The priorities of the armed forces for manpower have already threatened the nation with a food crisis because of depleted farm labor. The fabulous wages paid by the shipyards and certain war plants in comparison to those paid in the aircraft industry, and certainly in civilian services and supply, have created chaos in personnel relations and definitely confused and thus retarded the war production tempo.

Absenteeism is blamed for varying percentages of war production slowdown and with justice. Blame for absenteeism is being tossed back and forth between various factions like a volleyball. But "passing the blame" isn't solving the problem. Just as serious a cause for lost production is *overmanning*. This situation is not often recognized and certainly it has received little or no publicity.

Working under the convenient cost-plus contracts many war industries, the shipyards and aircraft factories especially, have advertised for and recruited workers from every civilian service and supply business. The lure of higher wages and more overtime at time-and-a-half, plus a patriotic appeal, has drawn far too many skilled and semi-skilled people from almost equally essential

jobs in repair and maintenance shops, public transportation, utilities, food processing and certainly the farms. After being hired they sit around waiting for someone to give them something to do. Those with self-respect quit and go back to other jobs. The "gold bricker" hangs on and takes the pay. The prime contractor doesn't care too much because he is working cost-plus.

Not only is this wasteful of manpower but disruptive of the industries and services from which these people are recruited. It all runs up the cost of the war and the cost of living and in a thousand little ways slows the war effort.

A belated and rather hesitant attempt is being started to "freeze" people to their jobs in certain areas by making it necessary to obtain a release from one employment to switch to another. Extension of the work week arbitrarily to 48 hours, regardless of circumstances, is another of these mandated blanket solutions-from-above that work out so poorly in detail. Both schemes sound good but work inequitably.

Until something more like the controlled materials plan for manpower is put into effect, the situation will continue to be confusing and costly of both time and money. Surely by now a count of manpower is possible, the same as it has been with materials. By some intelligent planning definite allocations of manpower can be set up for the armed forces, for war industries, for agriculture and for essential services, for maintenance and repair and civilian needs. And as with materials each "claimant agency" can be told to get along with that allotment as best it can, with autonomy as to how such manpower is to be employed, what hours, what conditions, what schedules.

Such an allotment would place a premium on labor-saving and efficiency to turn out the maximum war production with the minimum of personnel. It would restore American enterprise and ingenuity to workmanship and personnel efficiency.

Help for the Wardens

ELECTRICAL people who have watched the organization and training of air raid wardens up and down the Pacific Coast have shuddered to think how these men might cope with fallen wires should there ever be an "incident," as the British call bombings. Few of these men are technically trained. Almost none know anything about the dangers of handling live circuits. No one has had the responsibility for training them against the hazards of fallen wires.

Now at long last the Accident Prevention Committee of EEI has come forward with a set of suggestions covering emergency conditions when electric service facilities might litter the streets following an air attack. The suggestions are clear, concise and simple. They emphasize that the thing to do is to let fallen wires alone. Civilian wardens who study them will realize the dangers inherent in live circuits. EEI has suggested that the instructions be published by the Office of Civilian Defense. So as to insure that wardens in every community receive copies, it would be wise for individual power companies to print them for circulation also. Such a public service might save lives, would save lives should an "incident" ever develop.

More Excuses

NOT alone in dealings with the public have the wartime tensions, trials and worries strained business relationships. Wartime jitters have broken out inside large organizations. Interdepartmental squabbles have developed. Lack of tolerance has appeared. Back-biting and jealousy have reared up. And all detract from efficiency, destroy morale and discourage good workers. Relations with suppliers suffer. Here, as in the case of the public relationships, the excuse is, "It's the war." Obviously it isn't the war. Usually it's failure to observe the simple tenets of good personal and business relationships.

I PRAY that for my part in this total war, I may waste neither my time nor my talents . . . I pray that whatsoever I can do, I shall do—and that I will do my part to the utmost of my ability; that I shall work harder and longer than ever before . . . I pray that I will not over-emphasize the importance of making a daily living, against the importance of making a sincere daily contribution to victory . . . I pray that I can realize, if needs be, how little of real value I may be accomplishing, instead of contemplating the little I do with applause-seeking satisfaction . . . I pray that I may never attempt to capitalize on conditions brought about by the war, when, as an American, I know the only thing that profits is helping end this war sooner . . . Yet—I also pray for the strength and wisdom to help plan the program for the peace . . . I pray that I may not care for either credit or criticism of my conduct, when, in my heart, I know I have done my best . . . And, I pray that I will be so guided that, in some small way, my earnest efforts will help in preserving the ideals for which we fight . . . This is my prayer, and my creed, and my pledge.—H. Freeman Barnes, sales promotion manager, Lamp Dept., General Electric Co.

Service Centers Open

RMEL starts with Denver on an expanding war program

Despite the lowering cloud of federal or state ownership that shadows many of its member-companies, Rocky Mountain Electrical League has launched one of its spectacular drives by the establishment of centers dedicated to war service and appliance service.

Public Service Co. of Colorado, largest of the electric concerns in RMEL's program, opened its service centers April 1, after clearing its sales floor in the Gas & Electric Building of all customary merchandise and installing demonstration areas to visualize how electric household appliances work, and how to make them last for the duration. All this was adjunct to the main show: Well ballyhooed booths soliciting purchase of War Bonds and Stamps, and a Red Cross recruiting center.

Electric ranges, radios, washing machines, ironers, refrigerators and a complete line of smaller equipment are so displayed that visitors to the exposition will understand the working parts; how to oil, adjust and maintain them. An important phase will be to instruct the public in the maintenance of appliances and thus relieve severe pressure on utility service departments, electrical repair shops, contractors and dealers, whose principal stock-in-trade is replacement of worn or broken parts.

Movies, a stage show, huge posters and Disney-type cartoons, together with educational literature, lectures and entertainment features enter into the general pattern. For months, Public Service Co. has been accumulating a "stock pile" of discarded stockings, which is being used to demonstrate the transformation of silk into parachutes. Other displays include presentations of processes incidental to converting kitchen fats into bullets; preparation of tin cans for collection and conversion into armament.

George E. Lewis, RMEL's manager, states that similar, though probably less pretentious centers, will be in operation shortly throughout all of Colorado, Wyoming and New Mexico, with the prospect that neighboring states may join the activity. "Regardless of whether some of the participating utilities now operated by holding companies may soon be in the government's hands, or become state property as a result of pending Colorado legislation," said Lewis, "the urgent need to make present electrical equipment last a long time exists; the recruiting of Red Cross nurses and solicitation of blood donors must be carried on; and the sale of War Bonds and Stamps is a duty in which every American should feel his full responsibility."

The center at all Public Service Co. properties received advance publicity in newspapers and over the radio.

VEA Carries On

Members of the Vancouver Electrical (Contractors) Assn. held their eighth annual dance at the Commodore Cabaret recently. Ald. and Mrs. George Miller, Mr. and Mrs. W. C. Mainwaring and Mr. and Mrs. T. C. Clark were patrons. Proceeds went to the Canadian Aid to Russia fund. Edmund E. Walker, B. C. Electric Railway Co. Light & Power sales engineer, was master of ceremonies. Earle Dunsmuir, Dunsmuir Electric, was chairman of the dance committee. Members of the committee were: J. Carmichael, R. Sutherland, C. Longley, R. Beaumont and J. Homersham.

Most of the problems of the electrical contracting industry at Vancouver, B. C., during the past year have been tackled by the officers of the Vancouver Electrical Assn. The executive has met at least twice a month and a general meeting has been held once a month.

Despite existing conditions affairs of the association are in sound financial condition and Victory Bonds have been purchased to the amount of $2,000. The association has maintained its membership in the Electrical Service League of British Columbia and subscribed $228 during the year to league funds. This is but a slight reduction over previous years.

Although wiring material shortages have increased considerably during the year the organization has been able to continue to handle range wiring jobs on the standard rate without any increase in price.

Volume of work handled for the B. C. Electric has naturally dropped, only totaling $3,374 as against $20,512 for the previous year, but this is due to the restrictions placed on sale of electric ranges by the government regulations.

Critical Materials

Three representatives from governmental agencies having to do with housing and critical materials made up a panel to which were addressed pertinent questions by the audience at the Feb. 25 meeting of the Northern California Chapter, International Association of Electrical Inspectors. The meeting was held at Pacific Gas and Electric Co. auditorium, San Francisco, and Harold L. Gerber, secretary-treasurer, acted as chairman. Questions as to priorities, copper wire restrictions, the housing critical lists, new rulings respecting the financing of war housing, and the problem of complying with these critical lists and with the local ordinances and California Industrial Accident Commission safety orders were discussed.

Year's end changing administration brought old and new officers of Electrical Maintenance Engineers of Southern California together. Seated are Walter Ritter, American Can Co., retiring president; Walter Smoker, Lockheed, new president. Standing are: F. L. Hockensmith, honorary member; Harold Sedgwick, Safeway; C. R. Miller, Western Precipitation; Glenn Farr, RKO Studios; Nels Swanson, American Can, secretary-treasurer; Miss Elizabeth Tobelmann, recording secretary; Stanley S. Bradley, MGM Studios; Walter R. King, National Biscuit; H. M. Schabbleman, Richfield Oil; Wm. H. Carter, General Petroleum

Protest Amendments

Vigorous protests to a number of amendments proposed to the California Legislature for the contractors' license law were voiced in a strong resolution passed at the annual meeting of the Electrical Contractors Assn. of Northern California Feb. 25 at San Francisco. These bills, known as AB 1327-28-29-30 and 1363, it was held, would destroy the value of the act in the protection of the building public against unscrupulous contracting.

In the election of officers it was voted to return the previous year's officers for another term. This continues T. L. Rosenberg, of Oakland, as president; W. A. Cyr, secretary-treasurer and as directors: George W. Abbett, San Francisco; B. A. Solomon, Pacific Grove; Seth Cone, San Mateo; J. D. O'Connor, Sacramento; H. R. Ecklund, San Rafael; Roy Butcher, San Jose; T. M. Robinson, Fresno; Grover Grider, Stockton. R. W. Griffin, San Francisco vice-president, having gone into the Navy, Ed Pierce, Vallejo, was elected vice-president in his place. The meeting adjourned to join with the electrical inspectors of northern California.

No Change

Returned to office were the complete list of officers of the San Francisco Electrical Contractors Assn., Inc., at its recent annual meeting. Only one or two vacancies on the board of directors, caused by resignation of members to go into war work, changed the slate from the official family for the past two years. President is George Abbett; vice-president, James M. Galvin; treasurer, George D. Smith; secretary, Edward W. Scott, of Lynch & Scott Electric, and the following directors: C. C. Severin, G. W. Spencer, C. L. Chamblin, California Electric Construction Co., Tom Harris, H. S. Tittle Co., B. J. Doherty, H. C. Wilson, and Noble A. Wright.

Full list of committee appointments for the Southwestern Section, International Association of Electrical Inspectors, was announced recently by O. D. Butterfield, of Torrance, Calif., president. Among the general committee chairmen are the following: *articles of association,* H. G. Ufer; *California state safety orders,* G. E. Kimball; *civil service,* O. K. Jones; *clearing house committee,* R. H. Manahan; *code coordinating,* F. A. Short; *investigation of electrical fires and accidents,* H. V. Dobson; *legislative,* R. H. Manahan; *membership,* N. J. Siggins; *ordinance,* C. E. Heise; *Pacific Coast Building Conference joint committee,* Victor W. Hartley; *publicity and public relations,* William A. Cyr. Annual meeting dates probably will be Aug. 30-31 and Sept. 1 at Los Angeles.

H. J. Chanon, standing, recently from Nela Park briefed his paper on cold cathode lighting for the Southern California IES recently. Beside him are L. A. Rice and Urban Beh, chairman

Meetings

I. W. (Ike) Borda, of Okonite Co., was installed as president of the San Francisco Electric Club at its Mar. 1 annual meeting, succeeding Frank C. Angle, Allis Chalmers Co. Clark Baker was re-elected secretary-treasurer, Charles Huyck of Graybar the *News Sparks* editor. New directors elected were Huyck, Al Meyer of Leo J. Meyberg Co. and W. A. Cyr, ELECTRICAL WEST. Arthur Bragg, General Electric Co., Hugo Becker, Westinghouse Electric & Mfg. Co., and N. R. Sutherland, Pacific Gas and Electric Co., were holdover directors, Sutherland filling out the unexpired term of James Moulton, now lieutenant commander in the Navy. Frank Angle becomes a director ex-officio. Committee chairmen appointed by Borda include Paul Chapman, PG and E, attendance; Willis Winter, Westinghouse, membership; Freeman Scharr, Bryant Co., program; Tom Johnson, PG and E, publicity; Dave E. Harris, General Electric Supply Corp., public policy; and M. M. Schnapp, G-E Co., reception. The inauguration was enlivened by the chairmanship of Al Joy, past president, and a skit relating to the disposal as scrap of an ancient trophy for membership won from the Los Angeles Electric Club and recently made the subject of a contest on attendance.

Instead of an annual convention or even a war conference somewhere in the East, the Illuminating Engineering Society has been planning to make its usual convention portable and take it to various sections and chapters throughout the country instead. Plans to have a talking movie convention program have been discussed by the officials of the organization. Ideas for such a program were requested from the Southern California and San Francisco Bay Cities sections and the chapters at Portland and Seattle.

G. Edward Pendray, assistant to the president and general advertising manager of Westinghouse Electric & Mfg. Co., New York, addressed the Los Angeles Electric Club Mar. 15. Author of scientific novels and originator of the "time capsule" idea at the New York World's Fair, Pendray appropriately envisioned the future in a talk titled *The Electrical Industry Looks to Tomorrow.* A. J. Bronold, Los Angeles manager, was chairman of the day.

Plans are under way for the annual meeting of the Northwestern Section, International Association of Electrical Inspectors, to be held at New Washington Hotel, Seattle, Aug. 26-27. Hosts will be the Electric Club of Washington, with R. A. Walker, secretary, in charge of convention arrangements, according to Fred D. Weber, secretary of the Northwestern Section.

Robert L. Dearborn, illuminating engineer of the Kaiser Co., was the Mar. 24 meeting speaker of the San Francisco Bay Cities Section, Illuminating Engineering Society, at San Francisco. He spoke on *An Approach to Maritime Industrial Lighting.* Designer of the lighting systems at the Kaiser shipyards, he discussed the particular problems connected with these installations.

Rocky Mountain Chapter of International Association of Electrical Inspectors held its annual meeting Mar. 25-26 at Albany Hotel, Denver, Colo. Among distinguished speakers on code subjects were Victor H. Tousley, secretary, IAEI, and Arthur Abbott, author of *National Electrical Code Handbook.* Full report of the meeting will be given next month.

How to Add Load to an Overloaded Feeder was presented to the Electrical Maintenance Engineers Assn. of Southern California at its Mar. 17 meeting by W. C. King, representing Cornell-Dubilier Corp. The other speaker was Z. H. LaPrade, who spoke on the conservation of critical materials. President Walter A. Smoker presided.

Walter Boland, manager, Western Region, receiver division, electronics department of General Electric Co., San Francisco, was speaker at the East Bay Electric Club, Oakland, Mar. 15. He showed a talking movie *Sight-Seeing at Home,* depicting television.

Appointed to head committees of the San Diego Electric Club are the following: Marvin Musgrove, program; Earl Warren, reception; Ralph J. Phillips, publicity; G. R. Gray, finance; Evan E. Shaffer, membership; E. T. Bailey, visiting and relief; William W. Powell, entertainment.

General Electric's "House of Magic" was a feature of the Mar. 8 meeting of the San Francisco Electric Club. An attraction at the New York and San Francisco fairs, the demonstration is touring the country to show at Army and Navy bases. San Francisco was the start of the tour.

Electric Club of San Francisco heard how the U. S. Engineer Corps built the Alcan highway through Canada to Alaska from H. W. Richardson, western editor of *Engineering News Record,* of Chicago, at its Mar. 22 meeting.

Spokane Section IES discussed conservation of critical materials and manpower at its Mar. 10 meeting. Members representing a cross section of the electric industry told how their operating practices have been changed to conform with war conditions.

Election of officers and a lively discussion of "question box" problems was scheduled for the Electrical Maintenance Engineers of Northern California at its Mar. 25 meeting in San Francisco.

Dr. Allen A. Stockdale, a member of the speakers' staff of the National Association of Manufacturers, addressed the Los Angeles Electric Club on Mar. 1. His subject was *America Tomorrow.*

Lighting developments in the war program was the subject at the Mar. 2 meeting of the Los Angeles IES. Capt. Gervaise S. Chittick, CWS, was the speaker.

PCEA *Panorama* — *Edited by Mary Shoop*

PCEA Sponsors Conference

Distributors, manufacturers' representatives discuss wartime limitations

Under the auspices of PCEA, distributors and manufacturers' representatives in the Los Angeles area met Mar. 8 to consider matters of contemporary importance.

A valuable discussion of Form PD1-X of the War Production Board was presented by a WPB representative. He informed the group that, although early use of the form may not have proved wholly satisfactory, the processing of the applications has been speeded up, and use of the form now is an effective means of obtaining stock to serve non-priority customers.

The desirable results obtained from a meeting of dealers and distributors held recently in West Los Angeles were outlined. The gathering proved a valuable means of providing dealers with an opportunity to discuss their problems with distributors. Likewise, distributors explained their policies, showing that many of them were made necessary by government regulations over which they have no control. A valuable mutual understanding was effected by the meeting.

The success of this dealer-distributor meeting led to plans for others to be held in Southern California. Preliminary arrangements have been made for one soon in Eagle Rock to serve dealers of that area, including Pasadena, South Pasadena and Glendale.

Membership Growing

Membership in PCEA for the new year is proceeding most satisfactorily.

Figures taken the forepart of February show that 85 companies have renewed their PCEA memberships and 11 new companies have joined. This is a better than 80% renewal of 1942 Class "A" company memberships. Most of those not yet heard from are required to send such matters east for approval. It is anticipated that a net gain in Class "A" members will be shown when the campaign is completed.

On Class "B" personal memberships and Class "C" associate memberships, a more extended campaign of individual contact is necessary, and the complete picture will not be evident for some time.

However, the membership committee reports that a substantial number of new members are being secured—probably enough to offset the loss of members to the armed forces.

I. W. Borda, The Okonite Co., San Francisco, is chairman of the membership committee. S. W. Scarfe, General Electric Co., Los Angeles, is vice-chairman. Each company member has a special PCEA representative to assist with Class "B" memberships.

School Record Good

The high sustained attendance record at the electrical appliance repair school sponsored in Los Angeles by PCEA amazed local school authorities, one of the training school's cooperating agencies. This continued attendance indicates the large amount of interest by students in the free training offered, and the demand for such practical instruction.

Attendance at seven of the nine classes was one of the requirements for certification. Thirty-four certificates were awarded at the close of the training period.

On the final night of the class, there was a severe rain and wind storm, but 34 persons were present.

Code Work Valuable

California cities appreciate PCEA's help in advising them of revisions to the National Electrical Code—this is shown by the large return of cards sent out with the last mailing to check interest in the activity. Post cards were to be returned if the assistance was proving valuable and the city wished to continue receiving it. They already have been received in large numbers (a 60% response to the middle of February) and they are continuing to come in.

Every city with an electrical ordinance receives from PCEA a notification of revisions to the National Electrical Code to bring it into line with the strategic materials list of the War Production Board. These are mailed on standard file cards containing a statement of the change and an interpretation of its relation to the Electrical Safety Orders of the State of California and the Uniform Electrical Code.

WHO AM I?

I was born Feb. 26, 1876, at Eastport, Maine. I attended Alameda grammar and high schools, and studied with the International Correspondence School. My first job was with the Edison Light and Power Co. in 1893, where I took a student's four-year course. I worked with the San Francisco Gas and Electric Co. and the Union Iron Works before I became associated in 1902 with the Century Electric Co. as assistant superintendent of government work at San Diego, Point Benito and Honolulu. From 1907 to 1910 I was superintendent of the Oakland branch of the Century Electric Co. I served two years as superintendent of the Kimball Electric Co. before I joined the City of Oakland in 1912 as chief electrical inspector. In 1939 I was appointed superintendent of the city's electrical department, the position I now hold.

I am a member of the Oakland Electric Club and the International Association of Electrical Inspectors, and am a past president of both organizations. I am now a member of the IAEI executive council and am a past chairman of the northern chapter of the association. I am an alternate member of the electrical committee of the NFPA. Who am I?

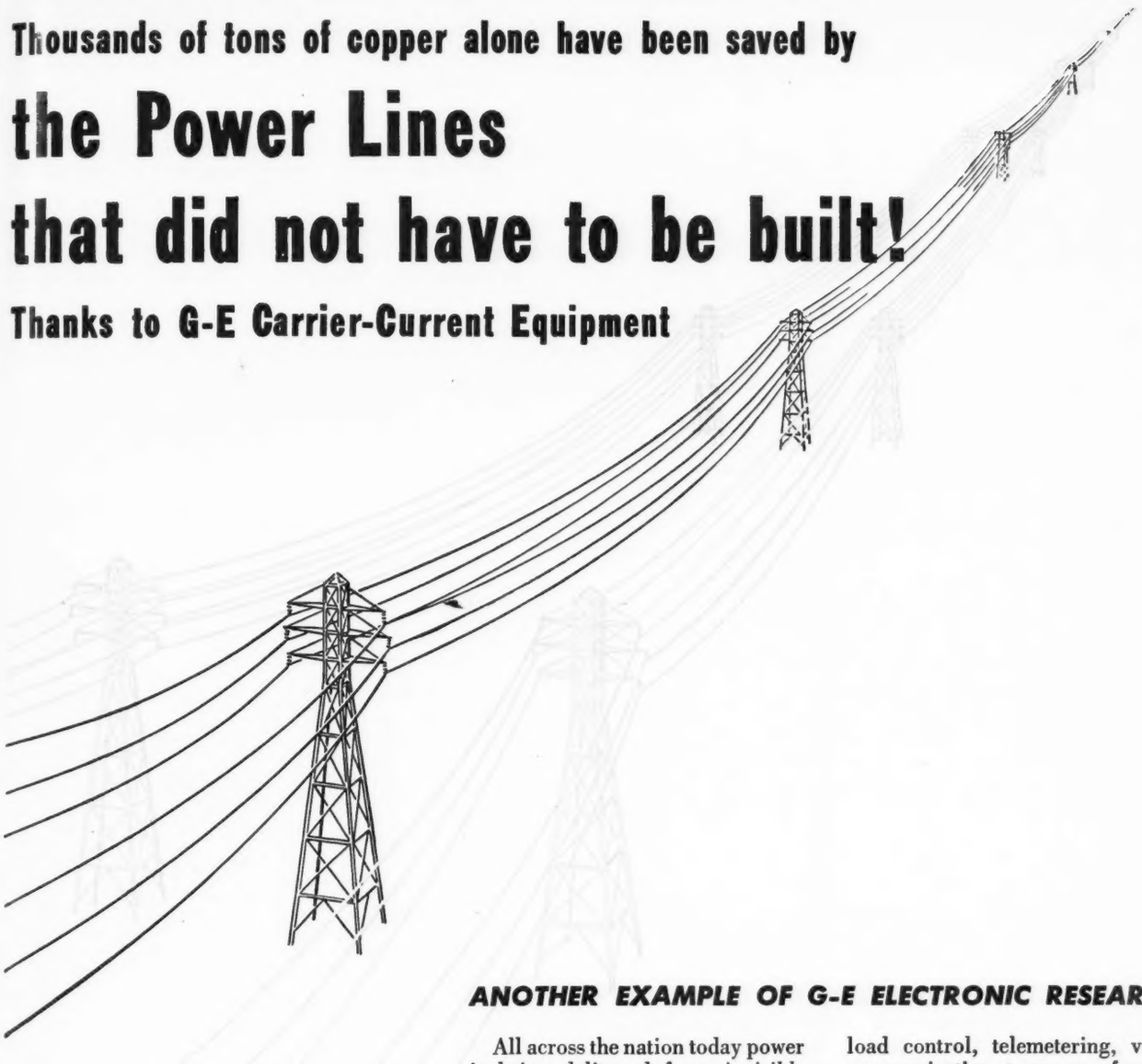
I was appointed to represent the inspectors association in PCEA, and have been active on the code and ordinance committee, of which I am now chairman. I am a member of Masons, Shrine and Pan-American Assn. My hobbies are gardening, golf and travel to scenic places. The latter, of course, is out for the duration. I am married, have one child, reside in Oakland and my name is: See page 112.

● MANY PCEA MEMBERS now in the service of their country regard ELECTRICAL WEST as a valuable means of keeping in touch with the industry during their absence. A large number are taking advantage of the special PCEA offer making the magazine available at a reduced rate to members in the service.

Thousands of tons of copper alone have been saved by

the Power Lines that did not have to be built!

Thanks to G-E Carrier-Current Equipment



ANOTHER EXAMPLE OF G-E ELECTRONIC RESEARCH

All across the nation today power is being delivered from *invisible* transmission lines. Kilowatts for airplane factories, arsenals, aluminum plants — in short, for war!

These phantom power lines are the ones that *did not have to be built* out of critically needed copper, steel, aluminum, insulation.

Carrier current made them possible!

New power lines and pilot lines are almost impossible to obtain today. Nor are they necessary, with G-E carrier current!

Today's G-E carrier-current equipment, backed by 20 years of research and improvement, is permitting existing power lines to deliver more kilowatts for war by means of pilot relaying, automatic load control, telemetering, voice communication, to name a few.

Carrier current, superimposed on the power lines, permits increased interconnections between companies, many new war loads on major transmission lines without loss of stability as loads go up.

The average carrier-current installation saves thousands of tons of copper and steel for every pound of these vital materials it uses. Comparable savings in other materials, and in critical wartime manpower for installation, maintenance, and patrolling, are the rule!

G-E carrier-current engineers welcome your inquiries, will be glad to make surveys, recommendations. . . . *Electronics Department, General Electric, Schenectady, N.Y.*

GENERAL ELECTRIC

151-81-6920

★

Demanded Wages vs. Earned Wages

Every man who must manage other men and women must sooner or later face the question of what attitude to take on a wage problem.

Most management men, today firmly believe that the higher the standard of living, the greater the opportunities for themselves and their business.

However, few people realize the difference between a true increase in living standards and a flat demand for higher wages.

The management man is often forced to resist a wage increase which he knows will handicap his plant, or his entire industry, and therefore, its ability to provide employment.

In meeting demands for wage increases which are not justified by more efficient operation, management seldom has the opportunity to defend its attitude toward real wages, based upon increased efficiency. If management does attempt an explanation, its arguments are often discounted.

To help give both public and government a clearer understanding of the difference between a demanded wage and an earned wage, McGraw-Hill has published the advertisement reproduced here, in Washington, New York and Chicago newspapers.

I hope you will read this entire newspaper advertisement carefully. Then, I will appreciate it if you will write me and let me have your comments. If you want reprints for your friends, I'll be glad to see that they are supplied.

James H. McGraw, Jr.

President

McGraw-Hill Publishing Company, Inc.

This
NEWSPAPER
advertisement was published in Washington, New York and Chicago by McGraw-Hill, to make friends for business.

Where do WAGE INCREASES *come from?*

In these days, when words like "economics" and "collective bargaining" help to obscure plain thinking on such old-fashioned problems as *earning a living* and *asking for a raise*, it is sometimes hard to remember that, underneath the chromium plate of words, things work out pretty much the same as they always have.

In the old days, every plant and mine was on its own. Economics was visible to the naked eye. You kept your costs in line with competition, or you took immediate consequences in reduced sales and employment. Today, if wages are increased through national wage agreements, costs go up in an entire industry.

► To many people that seems an improvement on the old-fashioned way, and few stop to ask where the catch is.

The simple fact is that new words cannot repeal arithmetic. National wage increases, like local wage increases, must be paid for either through higher prices or through lower costs, resulting from better equipment and more efficient methods.

Waiting down the road for the higher-priced industry is the same fellow who used to keep the single plants in line . . . THE BUYER.

This advertisement is available in handy booklet form. (Less than 100 copies free. Larger quantities, $1.50 per 100; $10.00 per 1000).

Where do wage increases come from? (cont'd)

The consumer always corrects high prices in the long run. Just as the high-priced individual plant lost business in simpler days, so the high-priced industry loses business today.

If coal, for instance, gets too high-priced in war, buyers will turn to other sources of heat and energy when they have the opportunity.

► This will happen in the case of a customer here and a customer there, but the total will pile up until the miners find themselves with high hourly wages, but without enough market for their product to keep them steadily employed.

This has happened before, where men have tried to lift themselves by a strong pull on their political bootstraps.

How can people live better?

It ought to be clear to Americans, of all people on earth, that better living comes only through doing things better.

It does no good to have more dollars in the pay envelope, if those dollars are going to raise prices. Higher prices make buyers look for a substitute for the things you produce. If the things you make don't sell, you live poorer, no matter what your hourly rate of pay.

That made sense when we were a little country. Doesn't it still make sense?

► Let's take coal, again, as an example. People can pay more for coal (thus allowing more for real wages) every time somebody invents a way to make each ton of coal produce more heat. The energy is in the coal. All we need for better living for coal miners is constant improvement in machines for getting heat out of coal.

—OR, miners can earn higher wages at the same price for coal every time somebody invents a machine for getting out *more coal per miner.*

Those two things—a better product, or the same product for less money—have been the secret of our better living. They always will be the secret. Any wages that are increased without them are a burden on every buyer.

In mining, as in all industry, the only way to get better living is to continue to use the old-fashioned recipe that has made America great.

Here is the recipe for better living, in mining and in all industry:

1. Constantly improve the equipment available for the worker.
2. Use the lowered costs thus produced to
   (a) lower prices to consumers
   (b) raise wages
   (c) provide incentives for invention, leadership and investment
   (d) lay aside "Seed Money" that can be used to start over again at item 1.

"Seed-Money" produces better living

America has always been an inventor nation. Throughout the years, most of the profits of business have been used to buy inventions . . . better machines, more efficient factories, research for better products. We call profit that is "plowed back" into business "Seed Money." Through Seed Money, products are constantly improved, making possible lower prices and higher wages.

Did you know that this process of putting aside Seed Money has been almost entirely eliminated by our tax law?

► Congress, in properly shutting the door on wartime profiteers, wrote the Excess Profits Law in such a manner that it also takes away most of the Seed Money of business.

Industry must have Seed Money to continue the work of making better products available at lower costs, to create more jobs and pay higher *real* wages. The Excess Profits Law must be changed if we are to provide Seed Money for making post-war jobs. If you think so, too, ask your Congressman to review this law and all laws —with this principle in mind:

"Industrial Progress is the Basis of all Good Living".

THE McGRAW-HILL NETWORK
OF INDUSTRIAL COMMUNICATION

22 publications, which gather "war-news" from the "war-production-front" through a staff of 153 editors and 725 engineer-correspondents . . . More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

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Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

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330 WEST 42ND STREET, NEW YORK

THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION:

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NEWS of the industry

COMMITTEE WILL STUDY COLORADO POWER BILL

After one of the stormiest sessions in history, Colorado's Thirty-fourth General Assembly consigned the State Power Authority measure to an interim committee, for study and recommendations to the 1945 legislature. On all other issues, the legislators agreed, or were in such complete disagreement that controversial bills died in committee. The proposed Colorado Power Authority, to authorize the state to purchase any electric or gas utilities offered for sale within the state (a program to buy Public Service Co. of Colorado, and other holding-company-owned concerns) was too strongly sponsored to die, but too weak to risk a test vote on second reading.

The interim committee was authorized to investigate every phase of the plan to establish the state as an operator of electric utilities, under a nine-man commission. While gas manufacturing and distribution was one factor in the projected bill, it was of such minor importance as to have been negligible. All information possible is to be obtained by the interim committee from the Securities and Exchange Commission, and, if conditions warrant, the governor will be requested to call an extraordinary session of the legislature; this proviso suggests that the assembly still might act favorably on the Power Authority if the SEC should, under the holding company "death sentence," take action to forcibly sever Public Service Co. of Colorado from the parent Cities Service Co. On one point only were state representatives and senators in accord: Rather than see the federal government take over Public Service Co., the state would do so through the measure introduced in January, adopting safeguards to insure against certain objectionable features.

Regardless of the Colorado Power Authority's ultimate destiny, observers believe definite harm has been done to the cause of private ownership of public utilities. Predictions of drastically lowered rates, plus the basic promise that some $2,000,000 now paid annually in federal taxes by Public Service Co., will accrue to the state, have created widespread opinion that "rates are too high"; and division of sentiment by utilities officials —some of whom bitterly opposed the power bill, while their associates stanchly favored it — strengthen the united front maintained by those favoring state socialism.

Determining factor in the legislature's decision to table action — and, at the same time, not kill the bill — was a message from the Securities and Exchange Commission asserting it "has no present intention" to seize Public Service Co. for failure to divorce itself from Cities Service Co., pointing out that Cities Service Co. will have one year to divest itself of the operating unit after final action by SEC; that an appeal to the courts can be made, and, anyhow, there is a move in Congress to nullify the "death sentence."

Legislature Acts to Impose State Tax on Bonneville

Both houses of the Oregon legislature have memorialized Congress in an effort to impose upon the tax exempt Bonneville power properties in Oregon and Washington the same type of payments to local governments in lieu of taxes as are imposed upon the TVA and Boulder Dam.

Public attention was recently drawn to the tax exempt character of the Bonneville utility when it was found that funds for operation of a school at the Bonneville dam was totally inadequate. This resulted in the legislative action.

Properties Not for Sale, Utility President Says

Proposals that the city of Albuquerque, N. M., embark upon municipal operation of its gas and electric utilities has brought forth a statement from Albert Prager, president of the Albuquerque Gas & Electric Co., that the company's properties are not for sale. A proposition involving ultimate purchase had been made to the city commissioners by E. F. Hutton & Co., in a proposed contract in which the bonding house would act as negotiator for a fixed fee.

The Hutton proposal was based on the belief that the SEC would order dissolution of the Federal Light & Traction Co., holding company for the Albuquerque utility, although no SEC hearing looking toward that end has been set. The proposed contract designates that the brokerage firm would act as intermediary in any purchase negotiations, furnishing engineering, auditing and legal services.

FPC GRANTS HEARING ON "CARRIER" ORDER

The Federal Power Commission last month announced its willingness to grant Washington Water Power Co.'s request for a hearing reviewing FPC's order directing the utility to act as a "carrier" for Bonneville Power Administration energy to an Army hospital and Army pumping plant near Spokane, in the company's service area. In announcing its decision, however, FPC asserted that it considered a hearing unnecessary and involving "unnecessary expense."

FPC's "carrier" order was the first exercise by the agency of the Presidential directive arming the commission with authority to see that the government obtains the "cheapest" source of energy for war needs. Kinsey M. Robinson, company president, appealed for a hearing on the grounds that the load involved is not larger than the "reasonable minimum" specified by the President, that Washington Water Power was buying only a portion of the energy needed to serve the load and that, considering the company's taxes, its rate actually was cheaper than Bonneville's.

The commission's reply, granting a hearing while in effect serving notice that a hearing wouldn't alter its decision, asserted that the company has inadequate dependable capacity for 1943 loads while Bonneville has surplus capacity. Neither the "reasonable minimum" nor the tax points raised by Robinson are mentioned in the commission's reply.

Two Cities Eye Purchase Of El Pasco System

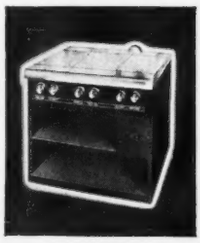
Both El Paso, Tex., and Las Cruces, N. M., are contemplating purchase of portions of the El Paso Electric Co. system if the death penalty clause of the holding company act is enforced against Engineers Public Service Co.

The Las Cruces city council has authorized the issuance of $1,250,000 of revenue bonds for purchase of the Messilla Valley division of the El Paso utility. The El Paso city council has retained Union Securities, Inc. of New York, to act as negotiator in any purchase proceedings. The security organization is to receive 1.1% of the purchase price and in return would bear the expense of surveys, engineering and fiscal reports preliminary to the purchase.

5
FROM ELECTROMASTER'S MARINE MASTER LINE

H 301A

H 301A
(with backshelf)



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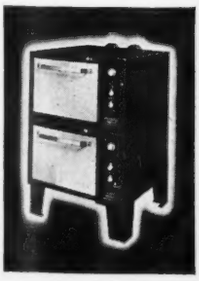

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HWO 101

When your specifications say "Electromaster or equal" you automatically assure yourself the best in electric cooking.

Electromaster heavy duty equipment is designed correctly, easily installed and serviced, built to take it. Pioneer methods of straight line electric range production insure prompt delivery at a sensible price.

Electromaster's frank challenge to "Compare—and choose" is worth accepting. Shall we send the data you need to make this comparison? Ask for complete catalog.

ELECTROMASTER INC.

1807 E. ATWATER • DETROIT

for every outdoor lighting job

. . . you're ALL WAYS right with

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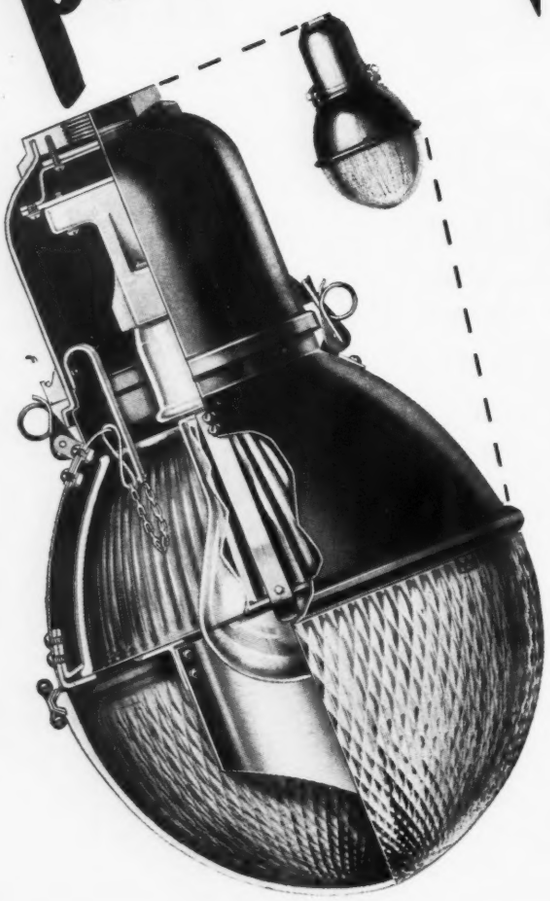

Whether you are lighting to protect a war plant or to increase safety and visibility on a street or highway, you'll find the L-M Prismalite *all ways* the right luminaire . . . for all outdoor overhead lighting.

RIGHT IN PERFORMANCE

For light reflection the Prismalite is the only outdoor luminaire using the glass prism—the most exact means known to science for controlling the direction of light. From a concealed light source the Prismalite distributes the light over a wide area . . . produces maximum visibility, minimum glare.

RIGHT IN PERMANENCE

The Prismalite retains its original high lighting efficiency for life. Its glass prism reflecting surface is utterly free from the mechanical and thermal deterioration which gradually decrease the efficiency of other types of reflectors.

RIGHT IN ADAPTABILITY

You can easily adapt the Prismalite to many different installations. A clear glass globe is easily interchangeable with three types of assymetric refractors which re-direct the light from a luminaire to a certain desired area. A variety of interchangeable hoods and brackets are available for every mounting requirement.

RIGHT IN LOW MAINTENANCE

The Prismalite is furnished with several types of glassware holders all of which effectively seal out moisture and dirt, yet permit replacing of glassware in the field. The glass prism reflector is well protected by the steel outer housing, yet can be easily removed and placed in a new housing. And you can safely clean the Prismalite reflector with Go-Corro, or a similar cleanser.

RIGHT FOR VICTORY, TOO!

The L-M Prismalite Luminaire with its clear glass prism reflector ties up no copper or other critical material needed for Victory. Remember, too, that you replace Prismalite glassware in the field. No need to maintain a reserve stock of luminaires to replace those which must be factory repaired.

Get full information from your L-M Field Engineer or nearest L-M Office, or write to Line Material Co., 802 N. 8th St., Milwaukee, Wis., for your copy of the L-M Prismalite Bulletin.

LINE MATERIAL COMPANY

LEGAL BATTLES FEATURE SEC HEARING IN OREGON

For 20 days in late February and early March, seven squads of attorneys battled over Portland Electric Power Co.'s tangled financial situation before the SEC in Portland, Ore. The hearing, which was continued from that held in Philadelphia last November, was conducted by Examiner William W. Swift. The purpose was to determine the feasibility of the bankruptcy reorganization plan presented by Thomas W. Delzell and R. L. Clark, independent trustees, to the Federal District Court in Portland last fall. A recess was taken on Mar. 10, "to be continued at the call of the commission," which unofficially indicated it might be reconvened in May.

Much of the 3.000 pages of transcript taken in the 20 days was consumed with legal battles among the seven groups of attorneys. Beside the commission and the independent trustees the following intervenors were represented by attorneys: the bond holders, the stockholders, the Bonneville Administration, Oregon Public Utilities Commissioner, and the Guaranty Trust Co. of New York.

One of the principal points of contention was whether or not the withholding of a long-term contract for power with Portland Electric Power Co.'s chief subsidiary, Portland General Electric Co., by the Bonneville Administration tended to depress the value of the company, and further, whether Bonneville had legal right to withhold such a contract under the Bonneville Act. The independent trustees and the stockholders claimed that Bonneville Administrator, Dr. Paul J. Raver, had gone beyond his legal authority in refusing a long-term contract to Portland General Electric Co. unless the company agreed to sell its Woodburn, Ore., and Vancouver, Wash., properties to the city of Woodburn and Clark County PUD respectively. The lack of this contract had an unfavorable bearing on the company's valuation, it was contended.

Very little of Dr. Raver's direct or cross examination testimony, adduced in two days on the stand was allowed in the record. Much of it was stricken by the examiner as irrelevant, or could not be fully clarified because of objections from his own and SEC attorneys. At one point Dr. Raver admitted that Woodburn and Clark County PUD had the avenue of condemnation open to them but that PGE was morally obligated to sell to them by negotiation, with Bonneville as negotiator.

As an example of the legal obstacles with which attorneys labored, one entire morning was consumed in an attempt to get a clear cut answer from Dr. Raver on one question. That question was, as originally stated, "Where in the Bonneville Administration Act do you find authority to withhold a long-term power contract from PGE unless an option to purchase the company's Woodburn and Clark County properties accompanies that contract?" The question was approached from a dozen different angles, but each attempted response was cut off by objections alternately from SEC counsel, Harlow B. Lester, and Bonneville counsel, C. G. Davidson.

Petition to the SEC by Harry Beckett, attorney for PEPCO stockholders, to force Dr. Raver to produce all his records relating to negotiations for a contract with Portland General Electric Co. and to the promotion of public power by Bonneville was denied by wire from the SEC in Philadelphia during the hearing.

A suit filed by the independent trustees against the Bonneville Administrator is designed to break the stalemate reached at the hearing on these points. In this suit the plaintiff asks court judgment as follows: "That the PGE is entitled to a Bonneville power contract without selling Vancouver or Woodburn properties as a condition of obtaining the contract; that Raver is without power to enforce any so-called moral obligation of PGE as a condition of granting it a contract; that Raver is without power to enforce any conditions not expressed in the schedules of the Administrator approved by the Federal Power Commission as a condition of the purchase of power by the PGE."

Utah Power & Light Asks Dissolution of Subsidiaries

Formal action for the dissolution of the Utah Light & Traction Co. and the Western Colorado Power Co., subsidiaries of the Utah Power & Light Co., has been taken by the parent company in a proposal filed with the SEC in Philadelphia.

Under the plan Utah P&L will assume the liabilities and cancel the capital stock of the two subsidiaries upon transfer of their assets. The company proposes to issue $37,000,000 of first mortgage bonds due 1973, and $7,000,000 of general mortgage bonds due 1958, with which to retire $32,375,000 of outstanding Utah P&L bonds due 1944, and $11,849,000 of Utah Light & Traction bonds due 1944.

COURT VOIDS EMERGENCY CLAUSE IN POWER BILL

Initiative No. 12, Grange-sponsored act granting extensive powers to PUDs to organize "super" combines to take over whole utility systems, passed by the Washington state legislature as an emergency measure, will be referred to the people for vote in the 1944 election as a result of a unanimous decision of the Washington State Supreme Court.

The court voided the emergency clause on constitutional grounds, thus giving the relators in the case 90 days in which to secure the 30,000 signatures necessary to refer the measure to the people in 1944. Relators were Kinsey M. Robinson, president, and J. E. E. Royer, vice-president and general manager, Washington Water Power Co., and Joseph E. Hall and L. J. Bunting, attorneys.

No. 12 was brought before the legislature by initiative under a process which prevented any amendments. It incorporated an emergency clause which made it effective immediately. Upon passage of the act an attempt was made to have the Washington Secretary of State certify a referendum, which was refused on the grounds that the emergency clause precluded such action. Application for a writ of mandamus to force acceptance of the referendum was made, in which the emergency phase was attacked.

In granting the writ the state supreme court said:

"We have no hesitancy in saying that the act is not necessary to the preservation of the public peace nor of the public health nor of the public safety. It is not an exercise of the police power. Nor, by any fair inference, can it be said to be in support of the state government and its institutions. . . .

"To uphold a legislative declaration of emergency such as this would destroy the referendum and would permit the legislature, or a group of electors barely sufficient to invoke the initiative, to impose its will upon the majority in any instance where it is seen fit to attach to an act a declaration of emergency."

The court made the writ peremptory, thus precluding appeal or further court action.

The utility officials who proposed the initiative have until June 9 to secure the necessary 30,000 valid signatures. If the referendum move succeeds in placing the measure before the people in 1944, the bill becomes frozen and any attempts to form the PUD combines are prevented.

FOR RURAL EXTENSIONS

Specify Crapo
STEEL CONDUCTOR!

TIME-TESTED *Crapo* Steel Conductors are "made to order" for the rural extensions authorized by WPB's Supplementary Utilities Order U-1-c. For these high-strength steel conductors, with their superior 60-cycle alternating-current properties, have proved their efficiency, dependability and economy in rural service all over the country for the last seven years.

Crapo HTC-130 Steel Conductor, in the No. 6 B.W.G. Stranded (3-wire) type adopted for these extensions, is available through Graybar Electric Company, Inc., Distributors. Ask the Graybar representative or contact the nearest Graybar branch office!

WRITE FOR NEW ENGINEERING MANUAL containing complete technical information on *Crapo* Steel Conductors, including electrical characteristics and performance, sag and tension data and applicable construction practices! Address:

INDIANA STEEL & WIRE COMPANY
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Crapo HTC-130
STEEL CONDUCTORS

SEC APPROVES UTILITY RECAPITALIZATION PLAN

Puget Sound Power & Light Co., Seattle, has received SEC approval of its $58,500,000 recapitalization program, it was announced recently by Frank McLaughlin, president of the utility. Under the new program, common stockholders will turn over voting control in the company to holders of present $5 prior preference and $6 preferred stock.

The recapitalization plan was filed with the commission by Engineers Public Service Co., Puget Sound's parent company and major holder of the common stock, in conformance with an SEC order to dispose of its interest in the utility and thus comply with the public utility holding company act of 1935.

To be opened Mar. 29 were bids for $52,000,000 of first mortgage bonds of a series to be due in December 1972. The money will be used to refinance at lower interest rates the company's debt securities.

According to McLaughlin, redistribution of equity ownership in the company will be accomplished under the plan as follows:

1. Holders of the existing prior preference stock will receive an additional one-fourth share of prior preference for each share now held, plus $2.50 in cash.

2. Holders of the existing preferred stock will receive 1-3.5 shares of new common stock for each share of preferred stock held.

3. Holders of the existing common stock (99.3%) owned by Engineers Public Service Co., will receive one share of new common stock for each 100 shares of old common stock.

Operating Expenses Up, Net Income Down, Utility Reports

Net income of Southern California Edison Co. in 1942 dropped more than 20% below the corresponding figure in 1941, it was reported by President Harry J. Bauer. Net income for 1942 was $10,017,487.

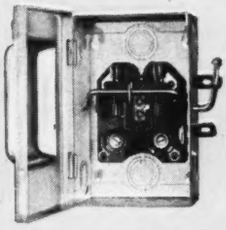
Gross revenue increased 9.4% to $53,708,041. Operating expenses exclusive of taxes and depreciation, amounted to $13,074,544, a gain of $1,378,072 over the 1941 figure. Taxes, which were 29.9% of gross revenue for the year, increased $4,809,382 to a total of $16,051,938.

Preferred stock dividends totaled $5,023,277, leaving a balance available for common stock of $4,994,210, equal to $1.57 per share of common stock outstanding.

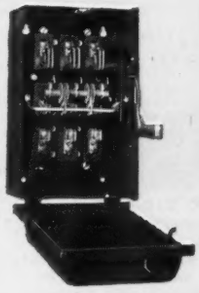
a Complete Line of safety switches

Weatherproof, dust-tight and explosion-resisting enclosures are available with ratings up to 200 amperes. Dust-tight switches approved for Class 11, Group G hazardous locations. Explosion-resisting enclosures approved for Class 1, Group D hazardous location.

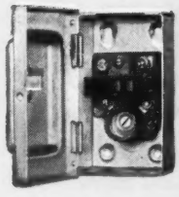
General Purpose Switches (Type D) are quick break only in capacities from 60 to 600 amperes inclusive. Thirty-ampere (and rain-tight) switches are not quick break. Made with 2, 3 and 4 pole and 2, 3, 4 and 5-wire s/n systems. 230 volt A.C. and 250 volt D.C.



Type A Switches with visible blades. Quick make, quick break and interlocked cover; rated from 30 to 2400 amperes, up to 600 volts. Horsepower rated. Fusible and not fusible. 2, 3 and 4 poles and 3, 4 and 5-wire, solid neutral.



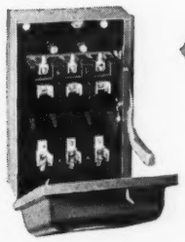
Blue Label Line—Type D Switches are compact, employing a rotary type of blade construction. Made for 2 pole and 2-wire and 3-wire, 230 volt A.C.-250 volt D.C. systems. Available for 30 to 60 ampere fusings. Front operated.



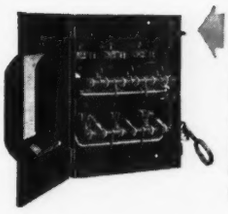
CALL IN A SQUARE D FIELD ENGINEER

If you have a problem which involves electrical control or distribution, you're welcome to the counsel of the nearest Square D Field Engineer. He is in constant contact with plants of every kind and size. He studies methods and applications with the idea of simplifying new jobs or doing old ones better.

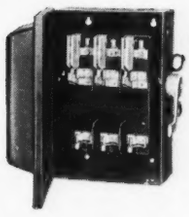
There are Field Engineers in Square D branch offices in 52 principal United States and Canadian cities. Their services are dedicated to solving industry's war and postwar electrical problems.



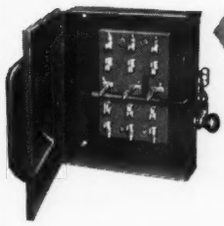
Type A Switches with concealed blades. Quick make, quick break and interlocked cover. Design permits smaller boxes with plenty of wiring space. Up to 200 amperes, 600 volts. H.P. rated. Made in 2 and 3 pole, 3 and 4-wire solid neutral.



Manual Motor Starters are available up to 60 amperes, 575 volts A.C. horsepower rated. Auxiliary blades shunt running fuses when operating handle is moved to starting position. Releasing handle automatically moves blades to running position with fuses in circuit.



Type C Industrial Safety Switches are quick make and quick break. Made up to and including 600 amperes, 600 volt. Fusible and not fusible. Horsepower rated. 2, 3 and 4 poles, and 3, 4 and 5-wire solid neutral. Also available in rain-tight enclosures.



Double Throw Switches. Made in sheet steel or explosion-resisting enclosures, approved for Class 1, Group D hazardous locations. Interlocked covers and quick make and quick break mechanism in sheet steel enclosures.

SQUARE D's unusually complete line of safety switches covers five divisions: *1.* Heavy Duty Industrial Type A. *2.* Intermediate Industrial Duty Type C. *3.* General Purpose (Type D). *4.* Double Throw Switches. *5.* Manual Motor Starters.

The predominance of Square D switches throughout industry speaks volumes for their performance.

SQUARE D COMPANY

LOS ANGELES - DETROIT - MILWAUKEE

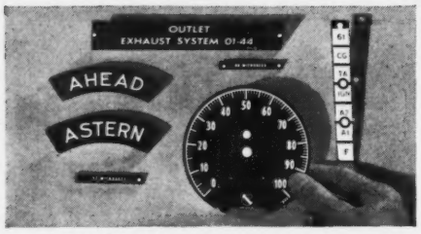
KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

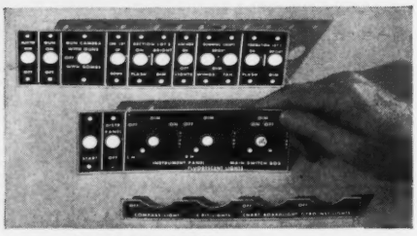
Look at all 4 types of

GRAPHIC LAMICOID

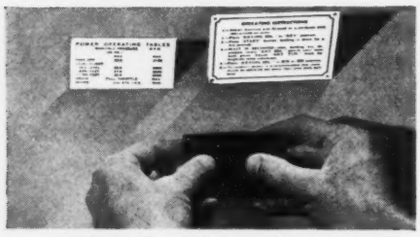
when specifying or designing equipment panels



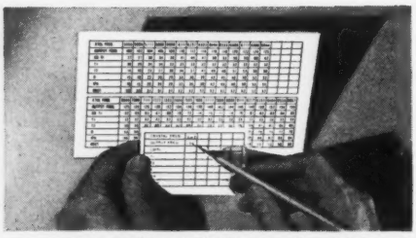
1 **STANDARD** — Printing, lettering, calibrations and designs are permanently bonded under the surface of this plastic resin sheet which has characteristics common to all four types: — Rich, permanent finish withstands moisture and handling: Tough and light in weight, yet readily drilled and machined.



2 **FLUORESCENT** — Sharp reproduction of fine detail is obtained with any of the fluorescent materials. They become an integral part of the sheet — not just a surface coat — and thus cannot chip or rub off during installation or in service.



3 **FLEXIBLE** — This semi-rigid sheet material is suitable for instruction or identification panels which must be attached to curved surfaces of equipment — or where serial numbers or other markings must be cold-stamped on the finished material.



4 **GRAPHIC FINISH 2-D** — This material was specially developed for panels containing charts, operating information and tabular data on which computations or temporary records must be made. The surface permits extremely legible writing in pencil or ink and repeated erasures without wear on the material.

IT'S EASY to see why thousands of designers have switched to Graphic Lamicoid for instruction and identification panels. They get an economical method for obtaining quantity production of identical panels . . . a choice of four materials that assures the right characteristics and finish for each job . . . clean-cut lettering and legibility even in the smaller sizes . . . and a lustrous plastic resin finish that prevents fading or obliteration.

See how the four types summarized and illustrated above are serving war contractors today. Then investigate how Graphic Lamicoid will meet your requirements—by sending samples or blueprints of the panels you need. We will quote prices on any quantity promptly, without obligation.

USE THE COUPON TODAY! E. W. 4-43

ANGUS-CAMPBELL, INC. (Factory Representative to Mica Insulator Co.) | 2122-4th Ave. Seattle, Wash. | 449 S. San Pedro St. Los Angeles, Cal. | 235 San Bruno Ave. San Francisco, Cal.

We are sending samples or blueprints of our _____

Quote prices on quantities of _____

This is NOT an order.

Name _____ *Title* _____

Company _____

Address _____

SEC CHARGES UTILITY WITH LAW VIOLATION

A civil complaint filed in the federal district court by the SEC charging that the Idaho Power Co. had made political contributions through the Idaho State Chamber of Commerce and other organizations in support of state and local office seekers contrary to provisions of the public utility holding company act of 1935, brought immediate forceful denials from President C. J. Strike.

"Along with numerous other business organizations," President Strike said, "Idaho Power Co. is, and intends to continue to be, a member of the Idaho State Chamber of Commerce and the Idaho Self Insurers' Association. We are likewise members of the National Farm Chemurgic Council and the Southwestern Idaho Water Conservation Project, Inc., and other state and local organizations which are working to develop agriculture and industry in the Snake River Valley.

"The future of the company is directly related to the welfare of the territory and the people whom we are privileged to serve, and our continuing policy will be to support any legitimate organization or industry whose aim is to further the development of southern Idaho. If this constitutes a violation of the law, it is time we found out about it."

Electro-Development Lab Slated for Northwest

Albany, Ore., has been selected as the site for a $500,000 electro-development laboratory being established by the Bureau of Mines for the purpose of studying new methods of using electric power in the exploitation of Pacific Northwest mineral resources.

Considerable rivalry developed among various localities in the region to secure the laboratory, with Spokane and Pullman, Wash., vying with Albany. The laboratory will be located in the buildings of the old Albany College. It will be devoted to war and postwar study of electro-metallurgical and electro-chemical processes for producing minerals and chemicals.

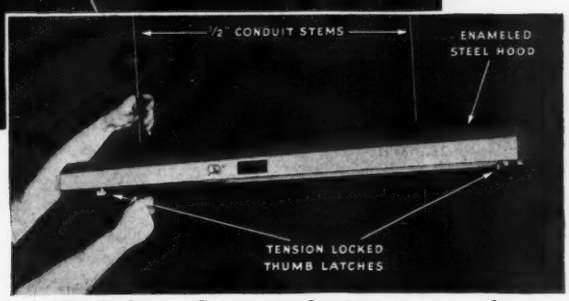
● BONNEVILLE POWER ADMINISTRATION moved its Mid-Columbia district office from Yakima to Walla Walla, Wash., effective April 1. Rapid development of the area and location there of a Bonneville operations field office and a U. S. Army Engineers office were given as reasons for the move. The district office had been in Yakima since its establishment in November 1939.

Westinghouse

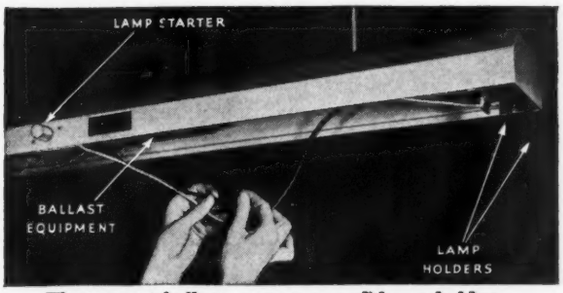
RLM NONMETALLIC REFLECTORS

provide

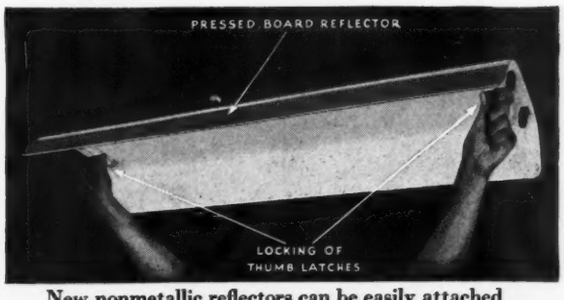
MORE LIGHT
EASY MAINTENANCE



Westinghouse fluorescent luminaires are easily installed. Units are arranged for rigid conduit, flexible conduit, or chain mounting.



Fluorescent ballasts, starters, and lamp holders are mounted in the hood. Units are furnished completely wired and ready to install.



New nonmetallic reflectors can be easily attached or detached. Units are approved by the RLM Standards Institute, and are so labeled.

For the want of steel—new nonmetallic fluorescent reflectors have been developed which give more light for 'round-the-clock war production and provide easy maintenance. They're the new Westinghouse pressed reflector-board reflectors—for 40-watt and 100-watt luminaires and for continuous-strip installations.

These easily detachable reflectors are interchangeable with previously installed equipment. There's neither wasted time nor effort in installation or servicing. Their durable, high-reflectivity finish resists scratching and chipping and is repellent to industrial acids and fumes.

Nonmetallic reflectors are further examples of Westinghouse engineered seeing—the ability to adapt lighting to present-day war needs. For complete information, just write Westinghouse Electric & Manufacturing Company, Edgewater Park, Cleveland, Ohio, and ask for Folder B-3190.

117 Westinghouse Electric Supply Company Offices and Independent Westinghouse Lighting Distributors provide local stocks and services.

Plants In 25 Cities—Offices Everywhere.

Westinghouse

LIGHTING EQUIPMENT

RE-LIGHTING

the new manpower / production *requirement*

OPERATION STUDY SHEET

Working Conditions *Light glare, causing hazardous working conditions—high accident rate on this section*

delays—new worker

Machine No. 340
Capacity —
Size —
Department N-32

Vital to accident-rate reduction

Glaring or insufficient light that makes seeing difficult is one of the principal reasons for lost-time accidents. *Re-lighting* your plant will help you save many of these man-hours of production, particularly on your night shifts.

Most plants operating today were designed and built for peacetime, daylight working schedules. *Lighting based on daylight conditions is inadequate to serve the needs of night workers.*

Re-lighting does not mean discarding your present lighting system. It merely means increasing the efficiency of your present equipment by re-locating lamps to eliminate glare and shadow, increasing lamp wattages where necessary, or installing additional equipment to insure uniform lighting levels. A Silv-A-King lighting engineer can tell you exactly what you need and how little re-lighting will cost.

Silv-A-King has specialized in industrial lighting for 22 years. Silv-A-King quality equipment (fluorescent or incandescent) plus a Silv-A-King "engineered layout" makes an unbeatable combination.

BRIGHT LIGHT REFLECTOR COMPANY, INC.
312 Morgan Avenue, Brooklyn, N.Y.

Send for your copy of our 16-page book: "Light Is An Essential Production Tool"

SILV-A-KING
MAKES *Light* WORK FOR YOU

BROILKING AFTER THE WAR, MORE THAN EVER *America's Finest Electric Table Broiler*
INTERNATIONAL APPLIANCE CORPORATION
1027 Metropolitan Avenue, Brooklyn, N. Y.

COURT DENIES APPEAL IN VALUATION CASE

Requested review of a Railroad Commission decision setting a valuation of $11,632,000 on the distribution system of the Pacific Gas and Electric Co. within the confines of the Sacramento Utility District has been denied by the California State Supreme Court. The district had sought a writ of review.

In its petition the district contended that the price set was too high and was based upon findings unsupported by testimony and upon erroneous legal grounds. It asserted that the final valuation was based on earnings in excess of a reasonable rate of return and that no evidence was introduced to support either business severance or idle plant damages, both of which had been allowed. The court denied the petition without issuing a formal opinion.

In the meantime the district has filed condemnation proceedings in the Sacramento County superior court.

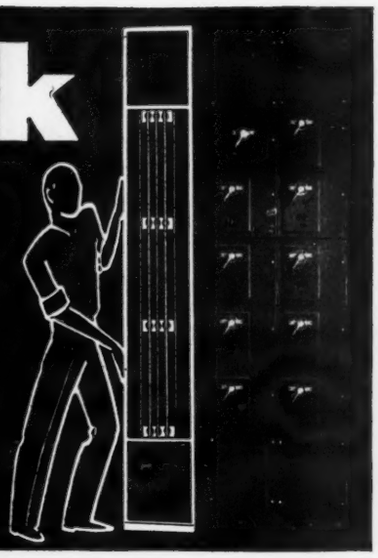
Walkout Follows Order to Increase Work Week

Ordered to increase their work week from 40 to 48 hours at straight pay or be discharged, eleven employees of the Modesto Irrigation District walked out, considering themselves automatically fired. Directors of the district had sent notice to the personnel that if the men did not work 48 hours at straight time they would be automatically discharged. The first two men who did not appear on the sixth day were discharged and the other nine refused to work.

The men maintained that if the district wanted them to work the extra day they should be paid at time-and-a-half as had been the custom for overtime in the past and was likewise the custom in all war production employment. They maintained that they were all old employees of the district, some of them had been with the district since it was first organized. They maintained it was not a wage dispute, merely a matter of policy as to whether an extended week should be paid for at straight time. They pointed out that they have had no raises and that their position does not give them the usual security status of other employment.

● Department of Munitions and Supply, Ottawa, has awarded contract for installation of a transmission line at a West Coast center, to the British Columbia Electric Railway Co., Ltd., Vancouver, at a figure of $40,000.

building-block simplicity..



Installation of four Motor Control Centers mounted back to back . . . 98" high, 21" deep, for each pair. CONTROL AT CENTER OR BY PUSH BUTTON AT MACHINE STATION.

CUBICLE PLUG-IN UNITS

Right: Control Center 13½" bus bar trough, with pull boxes top and bottom and Sizes 1, 2 and 3 motor control units. (Switchboard control units are in corresponding sizes).

Trumbull Centralized Electrical Control is assembled to meet your exact load and space requirements almost as easily as you might put together building blocks or file cabinets. We have, in fact, applied the principles of mass production and standardization of interchangeable units to give industry not only the simplest and most flexible, but also the most efficient cubicle switchboard assembly yet devised.

Here's how it works. First, you arrange Trumbull prefabricated bus bar troughs to accommodate the required number of control units in the space available (back to back, flat against walls or any way you wish). Then you install standardized switching and control units in the troughs by stab connections in a matter of minutes. Finally you make your conduit connections in the ample wiring spaces at top and bottom of the troughs and lead your circuit wires to individual units through the convenient vertical raceways built into the troughs to complete the flattest, neatest, most easily get-at-able dead front switchboard or motor control center you have seen. Everything is installable, removable, inspectable FROM THE FRONT. Trough sections or individual units can be changed or added just as quickly and easily . . . a necessity in busy plants today; assurance of flexibility for tomorrow's changing needs.

CONTROL CENTER SWITCHBOARDS

Type "A" switch units, Type "AT" circuit breaker units, 30 to 600 amps. or combinations of both may be grouped in any desired assembly to centralize power and light feeder-circuit protection and control. Also, the standardization feature permits the combining of both motor control and switchboard functions in one assembly.

TRUMBULL

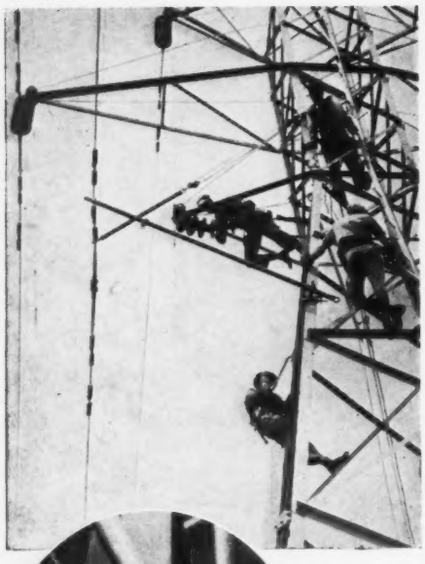
CONTROL CENTERS

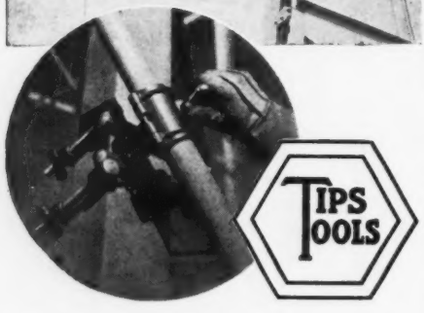
MOTOR CONTROL CENTERS . . .

The motor Control Centers are space saving assemblies in one cabinet of Trumbull combination magnetic starter with switch or circuit breaker disconnect. Sizes 1, 2, 3 or 4 . . . 3 to 100 H.P. Regrouping or expansion at any future time is most easily accomplished. Trumbullaid Bulletin 411 on request.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY • PLAINVILLE, CONN. • A GENERAL ELECTRIC ORGANIZATION

OTHER FACTORIES AT NORWOOD (CINN.) O. — SEATTLE — SAN FRANCISCO — LOS ANGELES





Tower Leg Clamps make "Hot Sticks" more versatile . . .

By simply adding this tower leg clamp, an insulated link stick, and cotter key tools to present equipment Tips Wire Tong sets can be used on towers to clear the way for repairing or replacing suspension insulators without interrupting service.

This method as illustrated above eliminates the need for special suspension equipment, and in many cases the job can be handled much quicker than by the suspension link stick method.

This tower leg clamp permits the wire tong to turn at almost any angle to contact the conductor. The link stick suspended from above by rope blocks, provides insulation protection and carries a big part of the load. The other equipment required consists of small cotter key tools which attach to an insulated universal pole.

A·B·CHANCE CO. INDUSTRIES CENTRALIA MISSOURI

POWER TAKE-OVER TALKED IN BRITISH COLUMBIA

Hon. John Hart, premier of British Columbia, in addressing the B. C. legislature has recently advanced proposals to put the government and the people of British Columbia in the business of generating electricity, with the municipalities handling distribution. Hart, in effect, invited Vancouver and Victoria to take over their tramways and electrical distribution systems from the B. C. Electric, with government aid, and he expressed belief that B. C. Electric shareholders would be quite willing to make a deal.

Simultaneously with this announcement concerning possible government ownership of power plants, Hart indicated that private eastern interests were seeking rights to undertake hydroelectric developments in British Columbia.

Couched in terms of utmost reserve, the premier's statement identified neither the interests involved nor the type of industrial development contemplated but it said that "preliminary surveys of one of British Columbia's most important power resources are contemplated by a very large eastern firm that operates an industry which may mean much to the development of British Columbia's resources."

The statement continued: "Overtures already have been made, and the firm has been assured that the government will give the fullest cooperation with a view to facilitating the survey work so that there may be no delay in reaching final decision in respect to any project that may be contemplated.

"Interested parties, it is understood, already have reached maximum development in their plans elsewhere, and are looking for a new field in which to expand should conditions justify such a policy. While market factors have to be considered this study will not delay action in respect to important field work necessary to the arriving at a definite conclusion."

If embarked upon, it is understood that a power unit of at least 250,000 or 300,000 hp. would be required in the initial stages so that the choice of water resources would have to be such as to permit development through the years up to a maximum of approximately 700,000 or 800,000 hp.

T. D. Pattullo, former prime minister of British Columbia gave some clue as to the possible identification of the eastern interests seeking power development rights in British Columbia. Pattullo said that while he was premier in the last government in B. C. he had negotiations with the Aluminum Company of Canada. It is also reported at Victoria that the Canadian Pacific is interested in further power development in British Columbia.

Federal Jury Sets Price On Puget Sound Properties

Snohomish County (Wash.) PUD must pay $9,500,000 for distribution facilities of Puget Sound Power & Light Co. in the county and on Camano Island, it was decided by a federal jury last month. Condemnation proceedings started Feb. 2 and were concluded Mar. 19.

Estimates of fair price introduced by opposing counsel ranged from four million to thirteen million dollars. Paul Coughlin, representing the PUD, named $4,000,000 as a fair price, conceding that an additional $80,000 might be allowed for severance. Lowell P. Michelwait, attorney for Puget Sound, quoted $9,000,000 as a minimum price without severance and asked for a judgment of at least $12,000,000.

PUD Starts Operations In Columbia County, Oregon

Clatskanie PUD, furnishing electric service to a section of Columbia County, Ore., began operating in March with the completion of purchase of a portion of the properties of the West Coast Power Co. Price was $150,000 and funds were obtained from the sale of $170,000 of a $237,000 revenue bond issue voted in 1942. Incidentally, the bonds were sold at an interest rate of 2.82%, the lowest rate ever secured by a PUD.

Title to the property was turned over to V. L. Shepard, PUD president, by L. C. McClurkin, president of West Coast Power. Manager of the PUD will be Alden Bailey and Arthur Holman will be chief engineer. Both are former West Coast employees. Power will be secured from the Westport Lumber Co., although the district has a contract with Bonneville to supply excess requirements.

● How to regulate wartime traffic control lights to a schedule which will give better tire and gas mileage and lower cost of upkeep is outlined in a new 16-page book, *Fitting Traffic Control to Wartime*, just issued by the Office of Defense Transportation. It contains details of the ODT-sponsored campaign for fitting traffic controls to wartime traffic conditions.

COLE builds switches for any voltage . . .

. . . here's one for 230,000 volts

Features of the Cole Type PU Switch

1. Silver to silver self-aligning contacts.
2. Pressure applied to contacts by preloaded springs
3. Sealed, frictionless main bearings
4. Effortless operation

Cole Type PU, One-Pole of a TPST, 230,000-volt, 600-ampere, Horizontal Break, Group Operated Disconnecting Switch.

Cole Electric Company

1510 SOUTH LOS ANGELES STREET, LOS ANGELES, CALIFORNIA

Western Representatives: CONDON & YOUNG, INC. • EICHER & BRATT
337 SOUTH HILL STREET, LOS ANGELES • COLMAN BLDG., SEATTLE, WASHINGTON

RELIABLE CAN HELP YOU

SAVE TIME

in speeding the war program by using Reliable Straightline splices on new construction and on maintenance.

SAVE COPPER

by using these perfect joint making units over and over again.

RELIABLE

STRAIGHTLINE SPLICE

Positive

Permanent

Low in Cost

Reliable ELECTRIC COMPANY
OVER 30 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE • CHICAGO ILLINOIS

NO POWER SHORTAGE IN UTAH, GROUP REPORTS

Utah's War Emergency Power association, composed of virtually all municipal and private electric utilities in the state, meeting last month after a year of operation, agreed that there has been no shortage of electric power in Utah and that no shortage is in sight.

Nine directors were elected as follows:

J. Hamilton Calder, chairman Provo city utilities board; H. C. Maughan, superintendent Logan municipal power system; J. S. Reece, Payson, office manager Strawberry Water Users' association; J. A. Hale, vice-president Utah Power & Light Co.; Rulon Barron, Brigham City commissioner in charge of utilities; H. B. Waters, Salt Lake City, president Telluride Power Co.; D. C. Watson, mayor of St. George; Reid H. Gardner, St. George, president and manager Southern Utah Power Co., and J. Bracken Lee, mayor of Price.

Developments during the year included the interconnection of the Murray municipal system to the pool and tests which showed that 1,500 kw. could be obtained through an existing connection with the Provo system. A list of spare parts, materials and equipment has been made up for the use of members in case of emergencies. Manpower and priorities problems were discussed.

Power Expansion Program Up-Rated to Speed Schedules

The 1943-44 power expansion program has been up-rated from the AA-3 and AA-4 level to AA-2X by the WPB Requirements Committee upon the recommendation of the Office of War Utilities. In addition, OWU has been granted "blank check" authority to issue AA-1 ratings for bottleneck items up to an aggregate of $5,000,000 of value.

Up-rating of the power program was done to prevent further slipping in the schedule for installation of generators and transmission lines required for war loads. The advent of other so-called "urgent" programs, such as rubber, octane gasoline, escort vessels, etc., in recent weeks has put power schedules an average of between two and three weeks behind the OWU schedule. It is not anticipated that the up-rating will reclaim the lost time but it is expected to prevent further delays.

In petitioning for the higher rating, OWU Director J. A. Krug pointed out that the power expansion schedule as now laid out represents less than one-half the volume of capacity expansion which had been planned for this year and next. Thus, with the program cut to "bare bones," he urged the necessity of maintaining the schedule of installations in harmony with the added war loads for which the generators are earmarked.

OWU's power supply engineers expect the fall months of this year to be the "tightest" period of 1943 or 1944. A large portion of the scheduled power installation is due late in the year, in time for the normal annual peaks, while many of the new war plants will be taking full quotas of energy by fall. Scheduled completion of many of these plants also has been delayed but not as much as the power program in some localities.

Use of OWU's "bank account" of AA-1 ratings is expected to be sparing. It will be granted only for individual items of equipment for a particular project, and only as a last-resort measure to maintain the schedule.

Inventory Control Offices Established on Coast

A clearinghouse for the exchange of materials by Pacific Coast utilties was set up by the War Production Board last month, with the establishment of utility inventory control offices at Los Angeles and Portland. The two districts are a part of a national program under the Office of War Utilities.

Wire, pipe, insulators and other material and equipment on hand will be listed in a master inventory and no utility may buy more than $100 worth of goods without first checking at its district office to see if another company has the needed equipment. It is hoped by this set-up to keep utilities supplied from within their own group and without the purchase of additional new materials.

Chief of the Los Angeles district is W. J. McCullough, former head of the Southern California Edison general stores division. McCullough is assisted by A. D. Spratling, of Pacific Gas and Electric Co., and D. S. Bowman, Bureau of Power & Light. At last report the Oregon district head had not been announced.

● CONTRACT VALUED at $14,000 has been awarded to the B. C. Electric Railway Co. for installation of power facilities at an R.C.A.F. station in British Columbia. Work is being handled for the Department of Munitions & Supply, Ottawa.

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DELAY THREATENED IN DEPARTURE OF WAR MATERIEL BY BROKEN BLADES IN STEAMSHIP TURBINE. PROPER BLADES RELEASED ON PRIORITY, FLOWN TO PACIFIC COAST PORT. AT WESTINGHOUSE DISTRICT MANUFACTURING AND REPAIR PLANT, SPINDLE WAS CLEANED, REBLADED AT MIDNIGHT, BALANCED BY 4:00 A.M., DELIVERED TO SHIP AND INSTALLED FOR SHIP TO LEAVE ON SCHEDULE AT 8:00 A.M.

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B. C. OUTLINES RURAL ELECTRIFICATION STUDY

Next year's estimates for the Province of British Columbia contain $500,000 to secure from a commission shortly to be appointed "reliable information in connection with the electrification of rural areas," according to Premier Hart.

The premier detailed the information wanted from the commission as follows:

1. Rural areas in which electrical service is now available:
   a. Source of electrical energy and terms and conditions under which the service is furnished.
   b. Number of consumers presently served.
   c. Number of potential consumers not presently served and the reason therefor.
   d. Proposed methods of improving the supply and availability of electrical service.
2. Rural areas in which electrical service is not now available:
   a. Number of potential consumers.
   b. Potential sources of electrical energy for such rural areas.
   c. Proposed methods of furnishing service.
3. Feasibility of supplying numbers of presently isolated communities from "grid" transmission systems and central production plants.
4. Preliminary estimates of the capital cost of works proposed for increasing supply and availability of electrical service.
5. Estimated rates under which electrical service may be furnished under proposed plans.
6. Financial problems involved in furnishing electrical service, including
   a. Whether financing of extension projects can be handled by existing utilities.
   b. Whether rates pursuant to extensions could be carried by new consumers without unduly increasing costs to existing consumers.
   c. If projects cannot be on a self-sustaining basis, how could they be financed?
7. Any other technical and economic information in respect to rural electrification within the province.

● IN A LETTER to the Seattle city council, the Technical Engineers & Architects Assn., requested salaries ranging from $210 to $700 a month on a 48-hour week basis for engineers and aides who work on the Ross Dam extension. Aides would get $210, senior engineers $528, supervising senior engineers $600 and principal engineers $700.

POWER DELIVERIES SHOW GAIN, UTILITY REPORTS

Pacific Gas and Electric Co. delivered 14% more electricity in 1942 than it delivered in the year preceding Pearl Harbor, it was disclosed in the company's annual report to stockholders released last month. Power supplied to military establishments and war plants was more than four times the amount used for domestic purposes in the city of San Francisco.

Additional power to meet the increased demands was available as a result of long-term planning begun prior to 1940, it was pointed out. Generating capacity had been increased by more than 300,000 hp. at the end of 1942 and another 300,000 hp. will be made available in 1943.

Gross operating revenues increased 10% over 1941 to reach $126,782,000, but this gain was more than offset by increased operating expenses. Taxes of all kinds amounted to $29,631.000, of which $14.851,000 was for federal income taxes—up 84% as compared with 1940. Pay roll expense, exclusive of wages to construction workers, was increased $1,022,000 to $19,558,000 in 1942.

G-E Short-Wave Radio Station Wins Award

First Alfred I. du Pont Radio Award was presented to KGEI, General Electric's short-wave radio station at San Francisco, at a dinner in New York on Mar. 6. The $1,000 award is for "meritorious public service in encouraging, fostering, promoting and developing American ideals of freedom."

The station was inaugurated during the San Francisco fair and in 1941 was moved to a new location in the Fairmont Hotel. The power of its transmitter was increased from 20,000 to 50,000 watts, at the same time.

The company has announced that it will add another $1,000 to the award money and will use the fund to encourage development of new program techniques in short-wave radio in foreign countries and in television.

● VALUE of the Narrows site on the Spokane River owned by the Big Bend Transit Co., a subsidiary of the Washington Water Power Co., has been set at $93,000 by a federal court jury. The price resulted from a condemnation action filed by the government in view of the fact that the site would be inundated by the Grand Coulee reservoir. The company contended the site was worth $750,000 while government witnesses placed a value of $31,000 on it.

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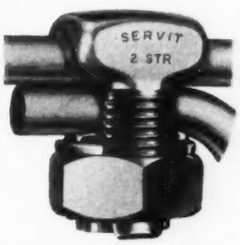

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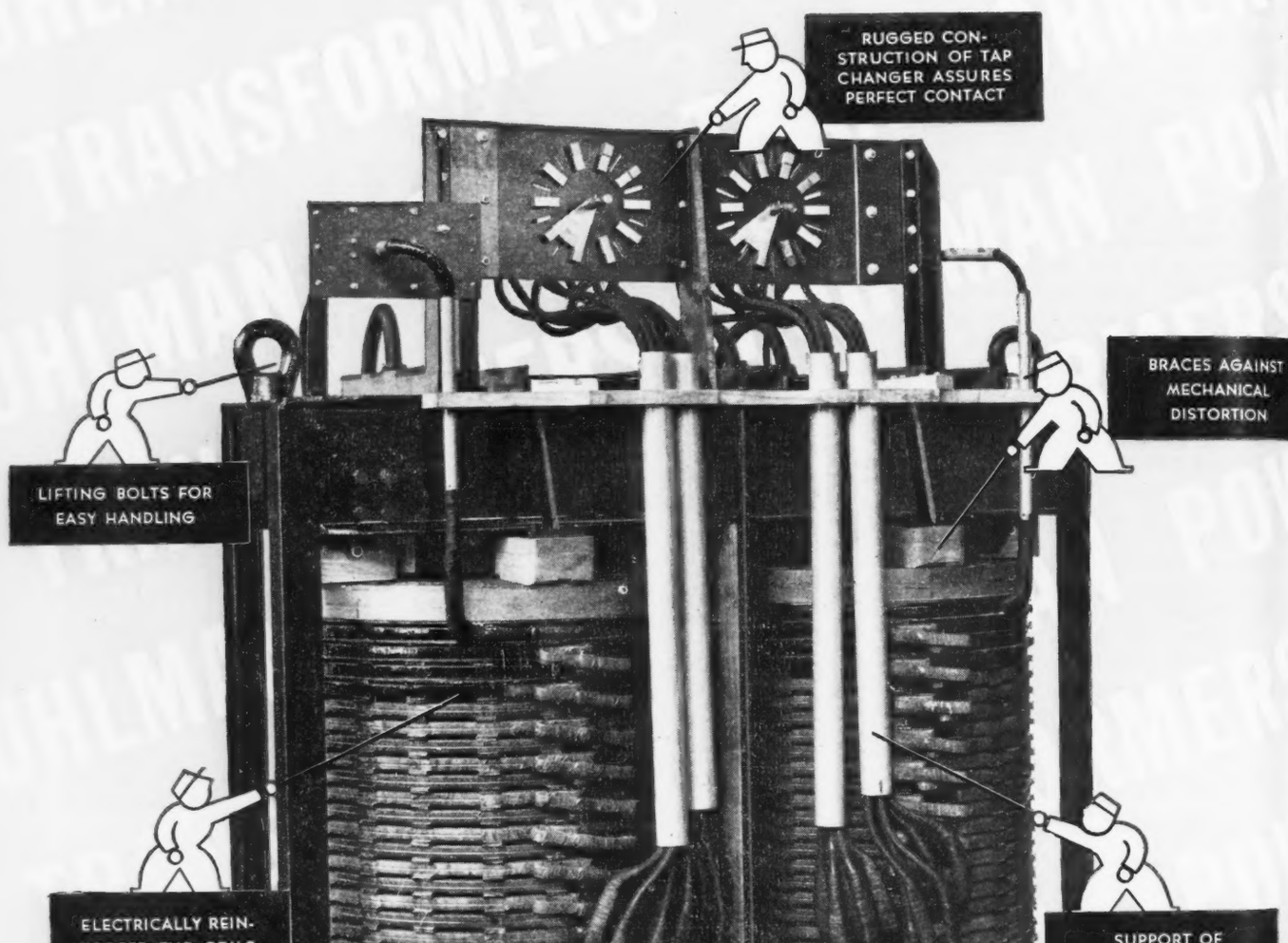
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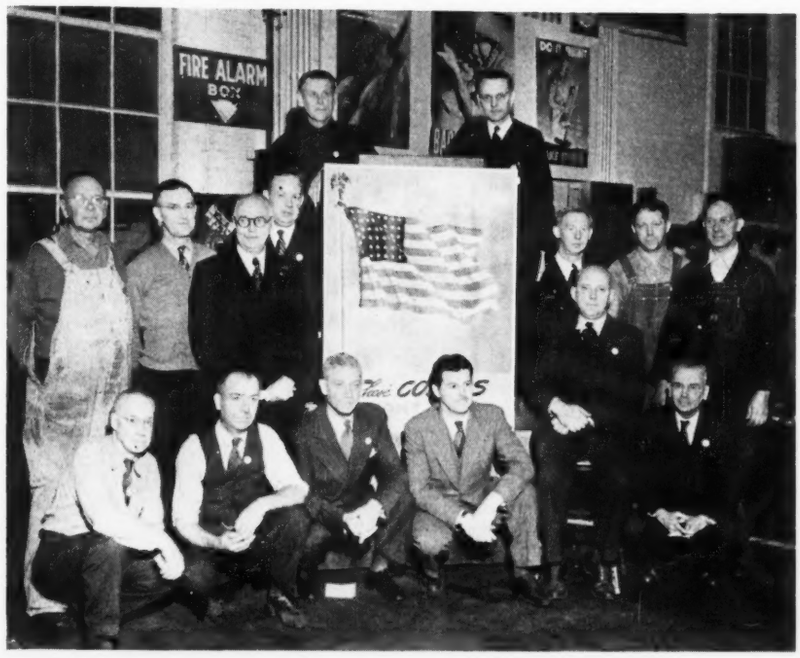
MICRO-WAVE ELECTRONICS STIMULATED BY WAR

Postwar possibilities of micro-wave electronics were sketched by Dr. E. U. Condon, associate director of the Westinghouse research laboratory, at the Mar. 3 meeting of the San Francisco section of the AIEE. Dr. Condon was reporting on current micro-wave research which has been stimulated because of wartime applications.

The fact that micro-wave circuits follow both electrical and optical patterns and that these waves can be transmitted in hollow tubes that are dielectrics may have some bearing on postwar applications. He told how the original of modern Radar installations was incorporated in the equipment of the French liner *Normandie*.

Dr. Condon is a University of California graduate who majored in physics. At present he is in charge of research in atomic physics for Westinghouse and also directs the efforts Westinghouse research follows in the field of pure science.



General Electric Oakland Works celebrated its twentieth anniversary last month, with brief ceremonies held during the lunch period to avoid interrupting war schedules. Left to right are (front) Charles A. Wilner; John J. Depew, N. A. Stone, Peter J. Blocker, Ernest J. Hoegemann, Harold F. Rogers (back) Dante Del Fava, William C. Dressel, Henry C. Schwinn, C. A. Hall, Otto Lipton, Gustave J. Christensen, Innocent S. Manakoff, Herbert E. Barnickol, W. George Kinge. All have long service records.

Edison Generators Soon To Go to Russia

Work is progressing on the removal of generating units 7 and 8 at Plant No. 2 of the Southern California Edison Co.'s Long Beach steam station. Increased production of urgently needed electric power for Russia is the purpose of the acquisition of the generators by the United States government for shipment to the Soviet republic.

To take the place of the generators removed, each of which has an operating capacity of 42,500 kw., a new 80,000-kw. generator will be installed in the Edison steam station. Now under construction by the General Electric Co., it is scheduled to be in operation about the middle of this year. It will be equipped to generate power either at 50 or 60 cycles.

"Friendly seizure" of the two generators for Russia was instituted by the procurement division of the United States Treasury to expedite delivery of generating equipment to fulfill Lend-Lease commitments.

Russia's demand for increased generating capacity is so acute that it cannot wait for the manufacture of new equipment. The Southern California Edison generators were selected because they generate power at 50 cycles, standard frequency of Russia.

About three months' time is being required to dismantle the generators. This leaves sufficient time to complete installation of the new generator in time to meet the peak demands of the Edison company's agricultural load.

All parts of the generating unit are cleaned and inspected upon removal, and repairs are made where necessary. Then they are provided with weatherproof coatings and crated for shipment, assuring their arrival at their destination in first class condition.

Stone and Webster Engineering Corp. is the contractor for the job.

New Batteries Incorporate Rubber Substitutes

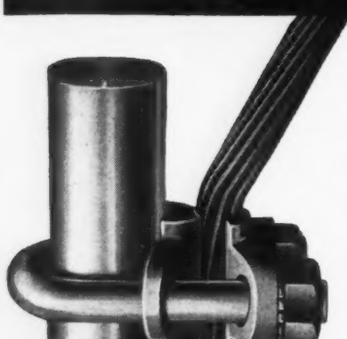
New heavy-duty industrial electric batteries incorporating rubber substitutes superior in many respects to the rubber originally used were introduced to the trade by executives of the Philco Corp. at a series of meetings held during March in Los Angeles, San Francisco, Portland and Seattle. The meetings were sponsored by Philco distributors.

H. S. Stanley, Philco research engineer, P. S. Harvey, sales manager of the battery division, and R. S. Jaccard, manager of industrial sales, all from headquarters, told the story of the new development. The new batteries have a "Vitrabloc" case instead of the customary hard rubber case. The "Vitrabloc" is a vitrified ceramic composed of four clays each selected for specific characteristics. These are moulded, vitrified and glazed and the resultant case is 40 to 70% stronger than glass. The new batteries are also non-explosive.

● A 20-YEAR CONTRACT providing for purchase of 625 kw. of Columbia River power has been signed by Bonneville and the Douglas Electric Cooperative of Douglas County, Oregon. The new contract supersedes contracts terminated when two cooperatives merged into the single agency. Until a transmission line can be built from Eugene to the cooperative's substation near Drain, delivery of power to the Douglas REA will continue by transfer agreement over lines of the California-Oregon Power Co.

● VACATION AND SICK LEAVE provisions enjoyed by federal civil service employees have been incorporated into a contract signed by the Clark County (Wash.) PUD and Local 125 of the International Brotherhood of Electrical Workers. The contract, said to be the first negotiated between a PUD and a labor organization, grants annual vacation of two and one-sixth days per month and sick leave of one and one-quarter days per month, with accumulations up to a maximum of 90 days for the duration.

Sure Ground



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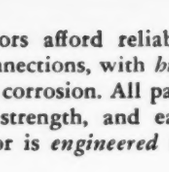

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VISITOR REPORTS ON WARTIME BUSINESS

Expressing especial admiration for the new war plants located on the West Coast and forecasting that most of them would become permanent adjuncts of a postwar industrial economy, A. W. Robertson, Westinghouse chairman of the board, toured Pacific Coast industrial regions last month. He reported that in 24 months Westinghouse business had expanded from an average of about $18,000,000 a month to $58,000,000 in February and a peak of $65,000,000 last December.

More than 90% of company business is on products related to the war, ranging from binoculars and shells to complicated Radar sets for the Army and Navy. The company now has about 98,000 workers, a quarter of whom are women. Most of these have been secured through normal employment channels and he reported that the company has a waiting list of job seekers.

Stream Flow Above Normal On Pacific Coast

Stream flow on the Pacific Coast in February averaged about 130% of normal at index streams from the interior of British Columbia to southern California, it is reported in the Water Resources Review. The flow reflected high January precipitation and high temperatures which caused snow melt at lower altitudes during parts of February.

Flow of the Columbia River at The Dalles, Ore., was 118,100 cfs. compared with a 64-year median of 89,360 cfs. Rains and melting snow brought floods and record-breaking February runoff in eastern Oregon and northern Nevada.

Water levels rose in most key wells along the Pacific Coast, with largest rises in southern California as a result of heavy January rains.

At Salt Lake City, storage in the underground reservoir decreased slightly in February but at the end of the month was the greatest since records were started in 1935.

● HIGH PRIORITY has been granted for materials to be used in the construction of a wood pole transmission line connecting the Shasta Dam project to the lines of the Pacific Gas and Electric Co., according to John C. Page, commissioner of the USBR. Present plans call for completion of the Shasta Dam power plant by January 1, 1944, with two units in operation having a combined capacity in excess of 140,000 kw.

WELLHOUSE APPOINTED TO CIVILIAN DEFENSE POST

Resigning because of ill health, Frank A. Hansen, illuminating engineer for the Ninth Region, Office of Civilian Defense, was succeeded by Fred J. Wellhouse, Westinghouse Electric & Mfg. Co. application engineer, who had worked closely with Hansen on a part-time loan basis from that company since the establishment of the OCD headquarters in San Francisco, according to announcement by James C. Sheppard, Ninth Civilian Defense Region director.

Hansen, director of the Western Institute of Light & Vision in Los Angeles since his retirement from business life many years ago on account of health, was regional vice-president for the Illuminating Engineering Society at the time of his appointment as head of the Light Control Division for the OCD, and was succeeded in that post by Wellhouse too. Wellhouse and John Walsh were appointed as lighting consultants for OCD for northern California by Hansen and served voluntarily in the office with him on loan from their companies. Walsh received an appointment as lieutenant, junior grade, in the U. S. Naval Reserve. William P. Bear, also of Pacific Gas and Electric Co., took his place at OCD and is working on applications from industrial plants for variances from Proclamation 12.

Although leaves of absence are granted only those entering the armed forces by Westinghouse, because of the military nature of the work he is doing, Wellhouse was given a military leave from Westinghouse to be appointed lighting control head for the Ninth Civilian Defense Region by Director Sheppard. Wellhouse continues as IES regional vice-president. It is notable that the entire dimout for the region has been placed in the hands of IES members and that Lt. Gen. John L. DeWitt recently commended these men for their contribution to the war effort.

● NOMINAL DAMAGE from fire occurred at the 165-kv. Brighton substation of the Pacific Gas and Electric Co. near Sacramento on Mar. 9 during a storm in which a lightning stroke hit the high tension transmission lines. The resultant flashover at the substation set fire to transformer oil in the substation building and dense smoke impeded efforts to control the fire. The same electrical storm caused minor damage to lines and transformers throughout the area, it is reported.

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PEOPLE
made this news

W. E. Hughes, Vancouver Electrical Leader, Dies

W. E. Hughes, president of Electric Panel Mfg. Ltd., at 1250 Richards Street, Vancouver, B. C., and one of the oldest figures in the electrical industry in Vancouver, died recently, following a brief illness. He was in his 76th year.

Mr. Hughes began his career when 17 with the Thompson-Houston Company in Boston, Mass., now a General Electric organization, and later joined the Cutter Mfg. Co.'s plant at Philadelphia as superintendent.

He went to the Yukon in 1898, then to Seattle in 1900, and finally arrived in Vancouver in 1910. In 1914, Mr. Hughes was with the Electrical Mfg. Co.'s plant on Industrial Island, and in 1921, in company with J. S. Don, the business of Electric Panel Mfg. was formed.

● ERNEST J. SCHWEITZER, retired president of Schweitzer Lighting Fixture Co., Los Angeles, died Mar. 6.

● ARTHUR L. "Pop" HUGHES, electrical contractor of San Francisco, died Mar. 7, age 67 years.

● GEORGE F. CHAPHE, electrical engineer of Portland, recently employed by the U. S. Army Engineers, North Pacific Division, died in that city in March.

Answer To "Who Am I?"
See Page 88
B. C. Hill

● H. J. NEWTON and GRAHAM HOLABIRD, of National Electric Products Corp., have both received promotions. Newton was called to Pittsburgh to become general sales manager of the company last month. Holabird has gone to San Francisco to become district manager in Newton's place. Holabird is a former San Franciscan, having many years ago operated the wholesale electrical firm named Holabird-Reynolds Electric Co. He has been active in PCEA and the former Los Angeles Electrical Development League.

● T. L. ROSENBERG, president and owner of T. L. Rosenberg Co., industrial electrical contractor of Oakland, Calif., was elected a director-at-large of the National Industrial Service Assn. at its recent war conference held at St. Louis Jan. 26-27. Rosenberg was also re-elected president of the Electrical Contractors Assn. of Northern California at its annual meeting in February.

● ALLAN MILLER, registrar of the California State Contractors License Bureau, has resigned and HERBERT WEYLER, formerly a licensed contractor of Santa Barbara, Calif., has been appointed to take his place effective April 1.

● FRANK MANSUR, formerly Southern California Edison Co. illuminating engineer, is now in naval officers' training at Cambridge, Mass. He also worked for awhile at the Navy Yard at Mare Island as a civilian engineer

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Brenton in Navy; Bankus PGE Chief Engineer

Walter Brenton, for several years chief engineer, Portland General Electric Co., has been granted leave of absence from the company for the duration to go into active duty with the U. S. Naval Reserves as lieutenant commander, Engineer Corps. Brenton joined the company as assistant engineer in 1929 and was made chief in 1930. He received his electrical engineering degree from the University of Oregon and his mechanical engineering at Cornell.

John Bankus, recently assistant chief engineer of the company, has been appointed chief engineer in Brenton's place. Bankus was graduated from the University of California in electrical engineering and spent two years with Crown Willamette Paper Co. in electrical installation work at Oregon City, Ore., and Ocean Falls, B. C. He came to P.G.E. 20 years ago.

BANKUS

● JOHN C. PLANKINTON, manager of the commercial department, Northwestern Electric Co., Portland, was elected president of the Pacific Northwest Y.M.C.A. Area council at the annual meeting of that organization held in Longview, Wash., Mar. 16.

● WILLIAM E. MELARKEY, formerly executive engineer of Hilo Electric Light Co., Hilo, Hawaii, is now lieutenant-commander in the 14th Naval District at Pearl Harbor.

● PROVINCIAL ORDER-IN-COUNCIL issued by the British Columbia government appoints as member of the executive of the Association of Professional Engineers of British Columbia: Professor F. Malcolm Knapp, associating professor and acting head, University of British Columbia forestry department; A. S. C. Musgrave and J. Blake, Victoria, and T. H. Crosby, Vancouver.

● LIONEL E. MOORE has been named Westinghouse X-ray division manager for the Portland area. He has been with Westinghouse for 10 years, first at Seattle and later at Los Angeles. Moore succeeds HENRY D. MORELAND, who was transferred to East Pittsburgh as manager of X-ray products for the agency and specialties division of Westinghouse.

● BERKELEY SNOW, executive secretary, Northwest Electric Light & Power Assn., Portland, was appointed vice-chairman of the 1943 Red Cross war fund campaign for Multnomah County in March.

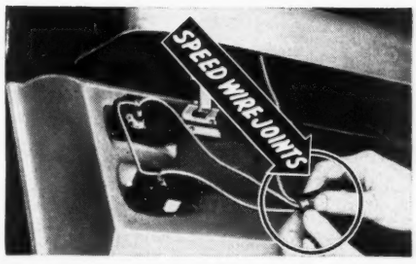
● C. P. CULBERT, Western manufacturer's representative for Proctor appliances, is now a captain in the U. S. Air Corps at Dayton, Ohio.

● LLOYD STEELE, Puget Sound Power & Light Co., is now lieutenant, senior grade, in the U. S. Navy.

● WALTER LIND, sales department, Pacific Gas and Electric Co., Oakland, has received a commission as lieutenant in the U. S. Naval Reserves.

● FIRST GIRL to enter naval auxiliary unit for women from General Electric Works at Oakland was LaVerne Remmers.

Stacy W. Litke, lineman helper for the Los Angeles Department of Water & Power, was the utility's one-thousandth employee to join the armed services. Here H. C. Gardett, Bureau of Power & Light general manager, congratulates Litke at party in his honor.



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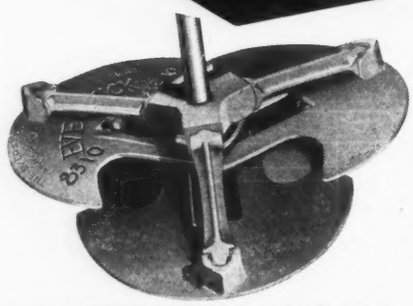

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● DR. SANFORD ALEXANDER MOSS, General Electric Co. turbine engineer and developer of the airplane turbo-supercharger, returned to his alma mater, University of California, from which he graduated in 1896 with a B.S. degree, and 1900 with M.S., to have conferred upon him an honorary degree of Doctor of Laws, at the 75th anniversary ceremonies of the university, Mar. 25, 1943. Dr. Moss had previously received a Ph.D. from Cornell for a thesis on the gas turbine. A native of San Francisco, he worked during school years as mechanic in pioneer machine and ironworks. At Schenectady he worked on the development of a gas turbine under the direction of Dr. Charles P. Steinmetz and Prof. Elihu Thompson in West Lynn.

TRADE *notes*

● RICHARD E. ARBOGAST announced from Salt Lake City the opening of an office of Newbery Electric Corp., of Los Angeles, in that city. He now heads the organization, his father GLENN E. ARBOGAST having retired recently. His brother, WOODROW ARBOGAST, recently moved to Phoenix, to open an Arizona headquarters for the corporation. This contracting firm has contracts in Utah, Arizona, California and Washington in various military and war production projects. ALVIN M. EVANS was placed in charge of the Utah office as superintendent.

● LINE MATERIAL CO. has moved its Los Angeles office and warehouse to new quarters at 916 East Third St. Paul K. Churchill is division sales manager and Paul E. Brackett is in charge of the Los Angeles office.

● RICKETTS-SEWELL ELECTRIC LTD., engineers and contractors, formerly operating from 429 West Pender St., Vancouver, B. C., is now located in new offices at 617 B. C. Mining Building, 402 West Pender St., Vancouver.

● FIRE which threatened the entire business district of Dawson Creek, B. C., boom town at the start of the Alaska Highway, gutted the premises of ARTHUR P. EVEREST, electrical supply dealer.

● ROBERT GRIFFIN, for the past several years proprietor of Crown Electric Co., electrical contractors, San Francisco, has closed up the business for the duration to accept a commission in the Navy.

The Manufacturers' Directory

TO USE THE DIRECTORY, locate the listing of the manufacturer you wish to contact. Under the company's name are listed the Western branch offices or Western representatives. If the name of the manufacturer is not known, turn to the "Where to Buy It in the West" guide and look under the product heading. • Every manufacturer operating in this territory is privileged to be included without charge. While this Directory is as accurate and complete as the publishers could make it, ELECTRICAL WEST assumes no responsibility for errors or omissions.

A-A ELECTRIC MFG. CO., THE, Bridgeport, Conn.—Alexander W. Bromberg, Los Angeles.

ACCURATE MFG. CO., Garfield, N. J.—F. J. Airey Co., Los Angeles; A. E. Rowe Co., San Francisco.

ACME STEEL CO., Chicago, Ill.—S. J. Johnson, Pac. Coast Sales Mgr., Los Angeles; Dist. Mgrs.: H. M. Angell, Seattle; Harry Holm, Portland; G. J. Stewart, Vancouver; R. W. Chaffee, San Francisco; W. F. Tucker, Los Angeles.

ACORN INS. WIRE CO., INC., Brooklyn, N. Y.—Keeler White Co., Seattle, Portland, San Francisco, Los Angeles.

ADALET MFG. CO., THE, Cleveland, Ohio—Angus-Campbell, Inc., San Francisco, Los Angeles.

ADAM ELECTRIC CO., FRANK, St. Louis, Mo.—A. F. Cook, Spokane; Columbia Elec. Mfg. Co., San Francisco; Zinsmeyer, Inc., Los Angeles; Fred E. Staible, Inc., Denver; Wm. R. Miller, Albuquerque.

AEROVOX CORPORATION, New Bedford, Mass. — Dist. Offices: Seattle, San Francisco, Los Angeles, Denver, Houston.

AJAX ELECTROTHERMIC CORP., Trenton, N. J.—E. A. Wilcox Co., San Francisco; J. Max Lee Co., Los Angeles; Fairman B. Lee, Seattle.

ALLEN-BRADLEY CO., Milwaukee, Wis.—Garland-A.Tolter Eng. Corp., Seattle, Portland, San Francisco; Zinsmeyer Co., Los Angeles; L. E. Belfort, San Diego; Peterson Co., Denver; Nickerson Machy. Co., Salt Lake City; C. F. Cate, El Paso; Industrial Machy. Co., Great Falls, Mont.

ALLEN CO., INC., L. B., Chicago, Ill.—H. B. Squires Co., Seattle, San Francisco; Sprake - Wilcox, Los Angeles; James H. Blinn Co., Denver; E. C. Coffin Co., Salt Lake City.

ALLIANCE MFG. CO., Alliance, Ohio—D. L. Herman, Seattle; Gillan Sales Co., San Francisco, Los Angeles, Denver.

ALLIED ELEC. PRODUCTS, INC., Irvington, N. J.—C. R. Hunt, San Francisco.

ALLIS-CHALMERS MFG. CO., Milwaukee, Wis. — Dist Mgrs.: A. J. Schmitz, Seattle; A. R. Kohlmetz, Spokane; F. V. Sams, Portland; F. C. Angle, San Francisco; A. D. Brown, Los Angeles; J. L. Singleton, Denver; B. A. Seare, Salt Lake City; O. F. Metz, El Paso.

ALL STEEL EQUIP. CO., INC., Aurora, Ill.—W. M. Sanderlin, Seattle; J. J. Noble, San Francisco, W. S. Sweet, Los Angeles; W. E. Young, Denver; L. V. Wilson, Phoenix.

ALUMINUM COMPANY OF AMERICA, Pittsburgh, Pa.—Sales Offices: Seattle, San Francisco, Los Angeles, Denver.

AMCO MFG. CO., Los Angeles, Calif.—General Distributors, Seattle; Frank D. Fagan Co., San Francisco; F. J. Airey Co., Los Angeles.

AMERICAN AUTOMATIC ELECTRIC SALES CO., Chicago, Ill.—District Offices: San Francisco, Los Angeles, Seattle.

AMERICAN BLOWER CORP., Detroit, Mich.—Branch Offices: Seattle, Tacoma, Portland, San Francisco, Los Angeles, Salt Lake City, Denver.

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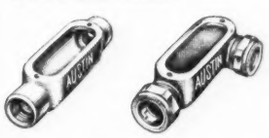

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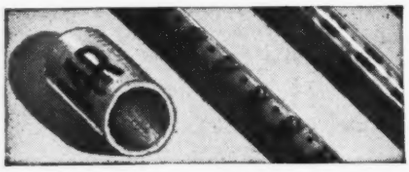

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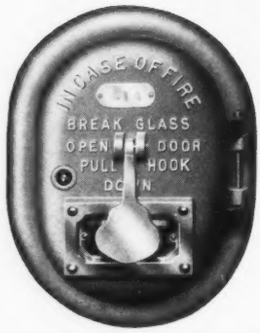

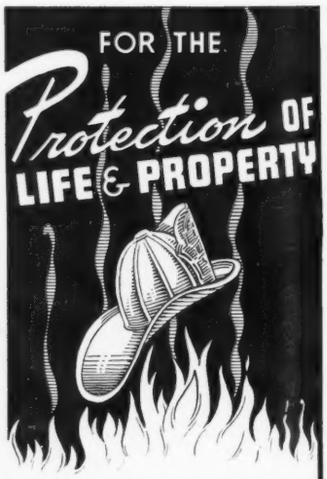

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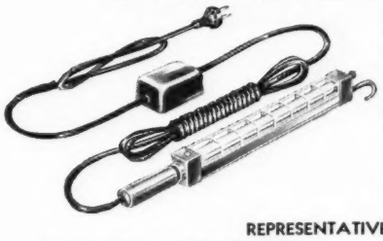

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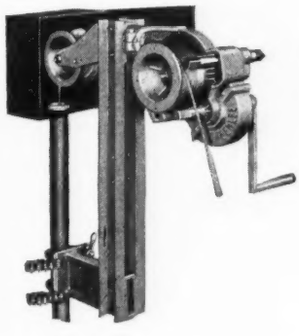

Cable Puller

To the left is the Greenlee Cable Puller set up for pulling into a box from a vertical section of conduit. Can be used in any position, is easy to take to the job, and easy to set up and operate. Ask for Cable Puller circular.

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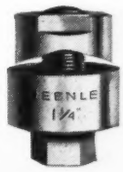

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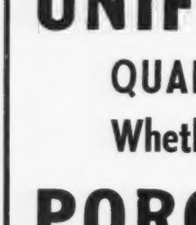

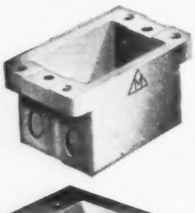

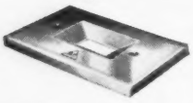

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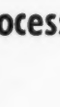

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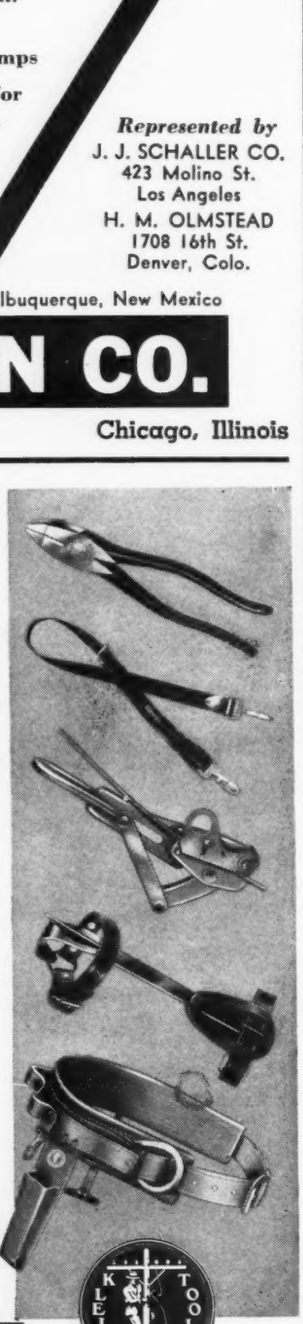

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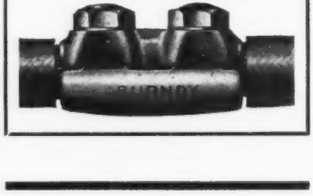

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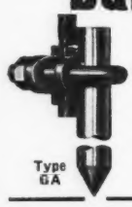

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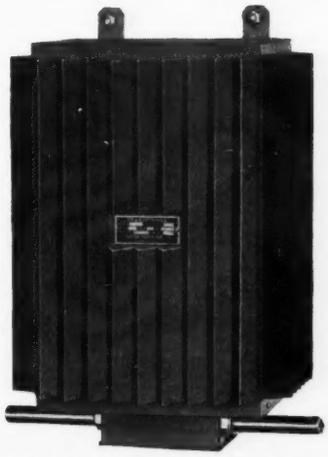

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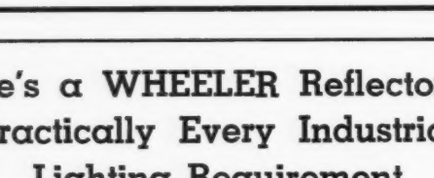

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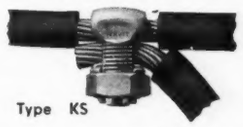

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Wiremold Co.

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Line Material Co.
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Sangamo Electric Co.
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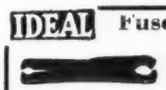

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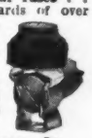

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Tom Wood

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Westinghouse Elec. & Mfg. Co.

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68 Post Street **Phone: DOuglas 4600** **San Francisco, Calif.**

and we will try to get it for you.

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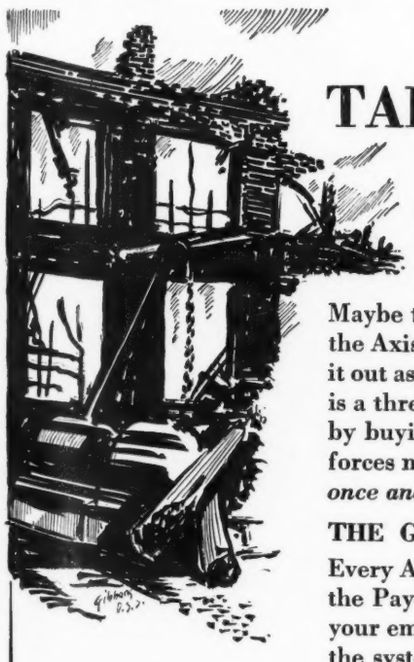
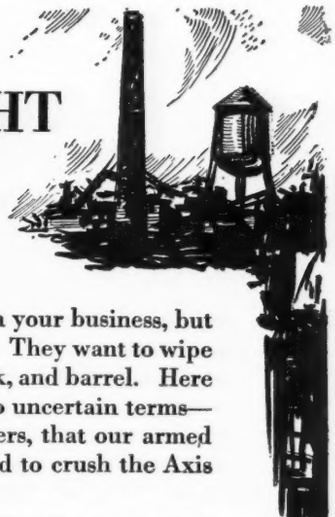


TARGET FOR TONIGHT

. . . *Your Business?*



Maybe they won't actually come and drop a *bomb* on your business, but the Axis war lords have their eye on it, just the same. They want to wipe it out as a competitive force—or take it over lock, stock, and barrel. Here is a threat that you can reply to *now*, today, and in no uncertain terms—by buying War Bonds to the very limit of your powers, that our armed forces may have the guns, tanks, and planes they need to crush the Axis *once and for all.*

THE GOAL: 10% OF EVERYONE'S INCOME IN WAR BONDS

Every American wants the chance to help win this war. When you install the Pay-Roll War Savings Plan (approved by organized labor), you give your employees that chance. For details of the plan, which provides for the systematic purchase of War Bonds by voluntary pay-roll allotments, write: Treasury Department, Section S, 709 12th St. NW., Washington, D. C.

Buy War Savings Bonds

This space is a contribution to America's All-Out War Program by

ELECTRICAL WEST

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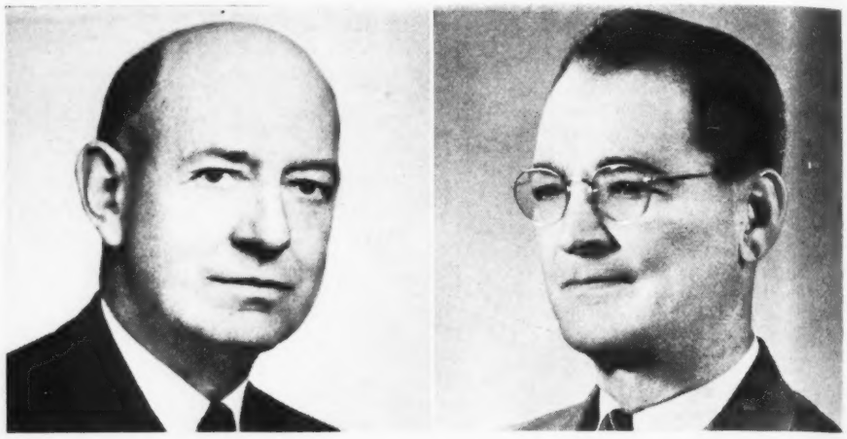


Two Westerners—Earl A. Slater (left) and James L. McCarthy—last month received the Westinghouse Order of Merit for distinguished service. Slater is assistant to the engineering and service manager for the Pacific Coast district. McCarthy is the company's engineering representative at Honolulu and recently was commended by the Navy for aid to ships and engineers at Pearl Harbor

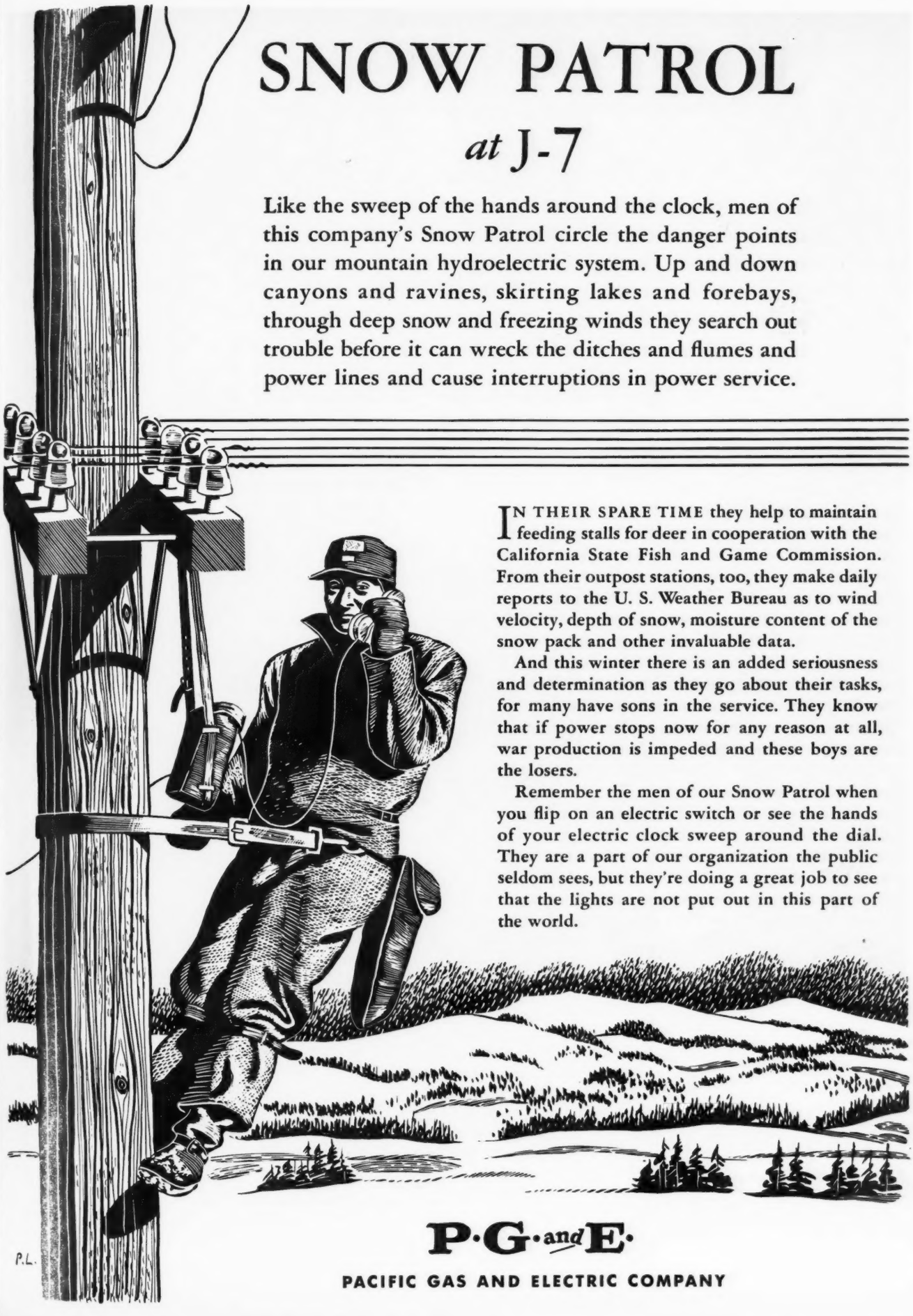
Officers of the Electrical League of Utah (left to right): Leland B. Flint, Flint Distributing Co., president; B. E. Rowley, Edison General Electric, vice-president; J. F. McAllister, Utah Power & Light Co., secretary-treasurer; George L. Nelson, manager. Not shown, Vice-President G. E. Ellerback, Utah Power & Light

When A. L. Adkins, San Francisco advertising man, called at the Pacific Electric & Mfg. Co. offices recently, he found Edward F. Sixtus, vice-president in charge of sales, and Sales Manager Henry L. Brooke in the above pose and recorded it

SNOW PATROL

at J-7

Like the sweep of the hands around the clock, men of this company's Snow Patrol circle the danger points in our mountain hydroelectric system. Up and down canyons and ravines, skirting lakes and forebays, through deep snow and freezing winds they search out trouble before it can wreck the ditches and flumes and power lines and cause interruptions in power service.



IN THEIR SPARE TIME they help to maintain feeding stalls for deer in cooperation with the California State Fish and Game Commission. From their outpost stations, too, they make daily reports to the U. S. Weather Bureau as to wind velocity, depth of snow, moisture content of the snow pack and other invaluable data.

And this winter there is an added seriousness and determination as they go about their tasks, for many have sons in the service. They know that if power stops now for any reason at all, war production is impeded and these boys are the losers.

Remember the men of our Snow Patrol when you flip on an electric switch or see the hands of your electric clock sweep around the dial. They are a part of our organization the public seldom sees, but they're doing a great job to see that the lights are not put out in this part of the world.

P.L.

P·G·and E·

PACIFIC GAS AND ELECTRIC COMPANY

Don't let it die out!

Think of the investment in Red Seal Adequate Wiring, the innumerable columns of advertising and publicity, the thousands of man-hours of promotional writing, speaking, consulting with architects and builders, selling people in and out of the industry on the comfort and convenience and dollars-and-cents value of wiring tailored to fit the home.

This is an investment worth protecting! Even if private building is out for the duration, we must not lose the momentum built up during eighteen years of almost continuous promotion. Ways must be found to bring in Red Seal wiring *whenever* we discuss the vision of a post-war Electrical Age.

This applies not only to our advertising but to our everyday conversations with neighbors and friends. Tomorrow *everyone* will be thinking of a new home!

PACIFIC COAST ASSOCIATION

601 WEST 5TH STREET, LOS ANGELES **447 SUTTER STREET, SAN FRANCISCO**